The Russian Forest Industry: A Case of Competitiveness and Export Taxes

Economics
Master's thesis
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2009

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Spring 2009

Approved by the Head of the Economics Department ___/___ 200___ and awarded the grade _____

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ABSTRACT
30 April 2009

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Objectives
This study examines the theories of competitiveness and export taxes and applies these theories to the Russian forest industry and the proposed roundwood export taxes that Russia is currently implementing. The goal of this study is to provide a well rounded picture of the Russian forest industry and to answer questions about what commodities it is competitive in, and about how will the export taxes affect its competitiveness and welfare. These goals are attained by utilizing various theories and by calculating parameters to better describe the Russian forest industry's current state. This thesis also looks at the global forest sector, its politics, and Russia's place in it, and calculates an optimal export tax for Russia.

Data
The trade data utilized to calculate the competitiveness of the Russian forest sector is gathered from the United Nations Comtrade database and includes 216 commodities classified at the 6-digit level from 128 countries. RCA and PRODY values are calculated for all commodities and an EXPY value for all countries for the year 2006. The Food and Agriculture Organization of the United Nations statistics database Faostat is also used to calculate an optimal export tax for Russia and Herfindahl Hirschman Indexes for the concentrations of global supply and demand for roundwood.

Results
The Russian forest sector is found to be competitive primarily in products with a low added value. The competitiveness of the sector is not below what is expected from a country in Russia's stage of development (measured by GDP per capita). The actual forest sector is fragmented in the case of logging, harvesting, and sawmills, and somewhat more concentrated in pulp and paper production. Russia is a major world exporter of industrial roundwood and hence could benefit from a relatively high export tax on roundwood exports, but the taxes currently suggested go even higher than this and are in effect prohibitive to trade. Russia faces a more concentrated world demand for its roundwood exports, but also operates in a more concentrated supplier market. Russia may be able to encourage investment into its processing sector by raising barriers to trade, but the costs of investing in Russia may remain too high to make this optimal even with the barriers in place. The main loser in the Russian forest sector because of the export taxes will be the logging and harvesting industry, while the main winners will be the sawmills and producers of plywood and pulp.

Keywords
Russia, forest industry, competitiveness, export taxes

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1. Introduction

1.1 Background

Since the collapse of the Soviet Union in 1991, the Russian Federation and the CIS countries have experienced a number or rapid transformations unseen in near history. The collapse of the state-run communist economy turned these countries into transitional economies, moving at various speeds and with multiple setbacks toward becoming more market oriented economies. Russia, as the largest member of these transitional economies and as a close neighbour to Finland, has always deserved special attention toward its development.

Immediately following the disintegration of the socialist system Russia experienced a sharp contraction in its economy. Old trade contracts were void, and years of government control had left Russia's powerhouse, the industrial manufacturing sector, uncompetitive. Demand for Russian products fell both domestically and abroad. The time period of 1991-1998 was troublesome, as the country's central government lacked a clear direction and was unable to develop the country in any direction. The unstable political climate was reflected in the poor economic performance of Russia's business sectors. Production quantities plummeted in the agricultural and industrial sectors, and for many products they have not returned to the Soviet levels even today.

The muddled decade culminated in the 1998 Russian financial crisis, which forced the government to devalue the rouble, and which initially devastated the country's populace and foreign investors. Through devaluation Russian products did suddenly become more competitive however, and so began Russia's gradual redevelopment. One of the main drivers of growth was the oil and natural gas sector, which benefitted from rising prices and abundant domestic resources throughout most of the following decade.

Because of the country's vast forest resources and its geographic proximity to Finland, the forest sector has always been of particular interest to Finnish investors, researchers, and policy makers. The Northwest-Russian forest "cluster" has been a major source of raw materials and intermediary products to Finnish pulp and paper mills, and the area has been a

limited target for investments by Finnish companies as well. Hence the development and competitiveness of the Russian forest sector is of great interest.

This interest was further fuelled when Russia announced that it was planning to place an export tax on roundwood to further develop its domestic forest sector. Over 80 percent of Finnish roundwood imports originate from Russia, and Finland imported approximately 25% of its total industrial roundwood utilization in 2006 (Faostat). Russia's plan to develop its forest sector's competitiveness through means of trade policy warrants thorough investigation.

1.2 Research problem and method

The development of the Russian forest sector may play a large role in the future of its Finnish counterpart. The sector has enormous potential in terms on natural resources, yet it has not been able to become a viable competitor to western producers in more processed products. This thesis will take an in depth look at the Russian forest sector in terms of two features: competitiveness and trade policy. Hence I will divide my research problem also into two parts. The questions are:

1. What products is the Russian forest sector competitive in?

2. What are the effects of export taxes on the competitiveness of Russia's forest sector, as well as the welfare of Russia as a whole?

The first of these questions can be quantitatively studied through the use of export statistics and trade oriented measures of competitiveness. Export statistics are available at a very detailed level in the United Nations Comtrade database, which reports over 95% of world trade. Dani Rodrik and Ricardo Hausman developed an index called EXPY, which measures the sophistication associated with a country's exports. The index has been previously used to study economy-wide productivity in China, but it is also suited for a more sectoral analysis. In addition to the EXPY, Russia's competitiveness in forest products is studied by calculating the Revealed Comparative Advantage (RCA index) for its most export competitive products.
The goal is to determine what products the Russian forest sector currently has a competitive advantage in, and whether the country has been "left behind" in the development of its forest

sector. To accomplish this, the current state of the sector is analyzed both in terms of individual products, and by comparing Russia to other countries in similar (and different) stages of economic development.

The second question receives a more qualitative answer. To answer this question this thesis will review the effects of export taxes from traditional economic theory, and also consider export taxes as a form of strategic trade policy. The basic effects of an export tax are analyzed using Lerner's symmetry theorem, which stated that the effects of an export tax are symmetrical to those of an import tax. This theory is then utilized and extended to consider the structure of the Russian forest industry and the effects of imperfect competition on welfare. The effects of export taxes will also be studied by comparing the situation in Russia to other countries where export taxes have been implemented or abolished. Earlier research on export tax effects provide us with more "real world" reasons why such trade policies might be implemented, and why they might fail or succeed.

1.3 Main results

The competitiveness of the Russian forest industry measured by export competitiveness yields fairly straightforward results. Measured by revealed comparative advantage (RCA), the industry is primarily competitive in products with a fairly low added value. When this measure is taken further and the competitiveness of the industry as a whole is compared to other countries with the EXPY indicator, it seems that the Russian forest industry, despite its low added value, is at least moderately competitive in relation to it's income level (gdp per capita). While this does not eliminate the possibility of trade policy to improve its competitiveness, it goes against the claims that Russia has become only a source of raw materials, plundered by more advanced economies for its abundant resources.

The effects of the export taxes on the competitiveness of the Russian forest industry and on the welfare of Russia are naturally more ambiguous and difficult to predict. By calculating an optimal export tax for Russia, taking into account its market power and supply and demand elasticities, we can see that the currently proposed export taxes are far above a "welfare-maximizing" export tax outlined by economic theory. This is hardly a surprise, since these export taxes had the stated purpose of being prohibitive to trade and are meant to encourage

foreign investment into the country and the development of domestic industry. For this reason I also touch upon a few theories that deal with the role of trade policy in industry development.

The development of the domestic industry was looked at in this thesis, first by studying real-world cases of export taxes and the Russian forest industry, and then by comparing the two for similarities and differences. In this way we could make comparisons between the different cases. The most important characteristics determining the effects of the roundwood export taxes are the concentration and characteristics of domestic supply and demand, as well as foreign supply and demand. Foreign supply and demand concentration was estimated using the Herfindahl Hirschman Index, while estimates for the domestic concentration were based more on earlier research. Results from this were twofold: Russia benefits from significant supplier market power while mainly exporting roundwood, but also faces more concentrated demand in this product. Both supply and demand were the least concentrated for paper production – the direction Russia wants to take with its forest industry.

Russia may be able to encourage production factor movements by raising barriers to trade, but it remains unclear whether these barriers do enough to make investing into Russia profitable. The hardest hit sector in Russia because of the roundwood export taxes will be the logging and harvesting sector. This will also have significant employment effects in many communities. The sectors that will benefit the most will be lumber, plywood and to a lesser degree pulp producers. This is because roundwood prices represent the most prominent part of raw materials expenses for these products.

1.4 Limitations

This thesis attempts to provide a well rounded picture of the Russian forest sector, and the effects of export taxes. As it tackles several theories to study a real-world phenomenon, it is bound to encounter the rift often apparent between economic theory and reality. This can be observed in the study of competitiveness through backward-looking export oriented parameters, and in the studying of export taxes mainly through terms-of-trade and efficiency effects. In the Russian forest sector case the idea of industrial transformation is equally relevant to the case at hand, but receives less attention because it is not as easily measured.

Related to, but separate from the rift between theory and practice, is the fact that a study of any real-world phenomena is bound to have to make simplifications and choose certain viewpoints. While this thesis has a definite focus on the Russian industry structure, many other variables undoubtedly also affect real-world outcomes. Additionally, while I briefly look at the forest industry's position globally and the politics involved, enough can never be said about the environment in which trade policy decisions are made. The interest groups and agents affecting political decisions are as numerous as the variables affecting outcomes.

The final increases on Russian roundwood export taxes are now on hold because of the world economic crisis. In what form they will eventually come to pass remains to be seen and their possible cancellation will naturally diminish the relevance of this study. It does not diminish the study of the theory behind trade policy and competitiveness, however, nor does it render irrelevant the analysis carried out on the structure and competitiveness of the Russian forest sector.

1.5 Structure of the study

This study begins with an overview of the relevant theories of competitiveness used to measure countries' competitive strengths in different commodities. The focus will be primarily on revealed comparative advantage and its uses in measuring competitiveness. Chapter 2.1 goes over the theory of comparative advantage and the RCA-indicator, and chapter 2.2 dwells on the more sophisticated EXPY-indicato. Chapter 2.3 goes over how trade policy may have an effect on competitiveness and introduces the idea of tariff jumping to encourage factor movements and affect industry structure within countries.

In chapter 3 the focus is on trade policy, and export taxes in particular. It starts with a review of Lerner's symmetry theorem, the starting point of all studies of export taxes. It then goes over the theoretical effects of an export tax in chapter 3.2, and provides a method of calculating an optimal export tax in chapter 3.3. Chapter 3.4 studies export taxes from a strategic trade policy perspective.

Chapter 4 takes a more real-world approach to export taxes. Chapter 4.1 goes over the usual justifications for export taxes and analyses their merit. Chapter 4.2 goes over two cases of export taxes. The first is of placed export taxes on cotton in Pakistan, while the second deals with the removal of export taxes on cashew nuts in Mozambique. These provide a link between the theory of export taxes and the practice and highlight the importance of industry structure.

Chapter 5 turns the focus to the Russian forest sector. Chapter 5.1 carries out the actual calculations based on chapter 2's competitiveness indicators and comes up with measures for the Russian forest industry's competitiveness. Chapter 5.2 goes over the situation in the world forest sector and places Russia "on the map". Chapters 5.3 and 5.4 focus on the issues at hand: the exports of roundwood from Russia, the politics of forest trade and the planned export taxes.

Chapter 6 will utilize the previous chapters to make conclusions about the effects of the export taxes on Russian roundwood. Chapter 6.1 compares the Russian case of export taxes to the earlier mentioned cases of Pakistan and Mozambique, and delves deeper into the global industry concentration of supply and demand for forest products. Chapter 6.2 deals with the welfare effects of export taxes on Russia, and calculates an optimal export tax for Russia. Chapter 6.3 focuses on the Russian forest industry and the income transfer within the industry that the trade policy is bound to instil. Finally, chapter 6.4 will look at export taxes from a strategic trade policy perspective in the unique case of Russia. Chapter 7 will present the conclusions of the thesis.

2. Theories of competitiveness

Competitiveness in economics usually refers to the ability of countries, industries, or firms to prosper in certain market conditions. It is an elusive concept, with few clear indicators. When studying the competitiveness of nations, economists usually approach the question through theories of international trade. The most common of these are the Ricardian model and the Heckscher-Ohlin theory of factor endowments, both of which contend that a country can have comparative advantage in producing a product. Later on these theories have been supplemented with the study of new trade theory, with its emphasis on intra-industry trade.

In the following chapter I will address these varying theories of international trade, their implications, limitations, and tools.

2.1 Ricardian model of comparative advantage and the Hecksher-Ohlin Model

The key aspect of the Ricardian model of comparative advantage is that countries can benefit from trade not only due to an absolute advantage in producing a good, but due to a comparative advantage as well. This comes from the realization that wealth can be created in a country by specializing in the production of a good that that country is internally most adept at producing, regardless of its competitiveness with others. This is because there is an opportunity cost involved when an advantaged country tries to produce all products itself instead of focusing on its most comparatively advantaged products. The prime parameter in models studying comparative advantage is the Revealed Comparative Advantage indicator, also known as the Balassa indicator. It is defined as

$$RCA_{ij} = \frac{X_{ij} / \sum_i X_{ij}}{\sum_j X_{ij} / \sum_i \sum_j X_{ij}}$$

Here X_{ij} is the export of sector *i* from country *j*. The numerator represents the share of sector *i* in the country's total exports, while the denominator represents the percentage share of the sector worldwide compared to world exports. The RCA indicator therefore provides us with a relationship of how much of a certain good a country exports compared to the rest of the world. There are several issues with this indicator. For one it only takes into account exports, and additionally it is a backward looking indicator, so it only tells us what the situation in a certain sector is now, instead of giving any indication of future potential.

The Hecksher-Ohlin model takes the Ricardian model a step further by introducing factor endowments into the mix. In the Hecksher-Ohlin model relative endowments of factors, such as capital, labour and land determine the comparative advantage that the country has in producing certain goods. Production that is labour intensive is best produced in a country that is labour-abundant, and production that is capital intensive is best produced in capital-abundant countries. This is a difference from Ricado's model, which only considered labour

as the resource, and had technology differences as the source of comparative advantage. The Hecksher-Ohlin model assumes identical technology everywhere, and considers the differences to arise from different production factor endowments.

The Hecksher-Ohlin model has certain advantages over the Ricardian model particularly when viewing transitional economies, such as Russia or former Soviet states. Many of these economies are already technologically advanced and therefore in the Ricardian model the small technological difference between them gives little reason for trade. The Hecksher-Ohlin model on the other hand takes into account the transition economies' abundant natural resources as a cause for trade. Unfortunately, however, the Hecksher-Ohlin model lacks a workable performance indicator.

Semir Daskapan (2008) developed a more advanced version of the Ricardian RCA and, also an indicator for the Hecksher-Ohlin model in 2008. Both of these indicators take into account factor endowments and therefore free the RCA from its traditional dependence on exports. The appliance of factor endowments also has its limitations, since factor price data is difficult to attain particularly in transitional economies.

2.2 The EXPY-Indicator

Dani Rodrik developed the Ricardian indicator of revealed comparative advantage into a more thorough tool for analysing different countries' export profiles. The indicator Rodrik developed is called EXPY, and it calculates an RCA for all of a country's exports, and then compares those parameters with countries' gross domestic products per capita. This way Rodrik was able to group commodities by the development stage of countries exporting them. Rodrik's EXPY consists of first calculating a $PRODY_k$ value for good *k*:

$$PRODY_k = \sum_j ((x_{jk}/X_j) / \sum_j (X_{jk}/X_j)) * Y_j$$

The PRODY value is basically the sum of the RCA indicators of all the countries exporting good *k*, multiplied by the per capita GDP of countries exporting said good. After calculating the PRODY, we can calculate the $EXPY_j$ for country *j*

$EXPY_j = \sum_l (x_{jl}/X_j) * PRODY$

EXPY provides us with a weighted index of the representative income associated with a country's exports, where the weight is simply the value share of the product in the country's total exports (Rodrik 2006).

The beauty of Rodrik's model is that it provides us with export profiles for countries based on their standard of living (per capita GDP). While far from perfect, it allows us to visualize countries' performance in exports compared to others in similar development stages. Rodrik used the the EXPY model to study China's exports, and found discrepancies in the advanced level of China's exports compared to the country's relatively low level of per capita GDP. Terhi Sipilä (2008) took the model further, and introduced another parameter, the IMPY. The role of the IMPY was to model countries based on the sophistication level of their imports in an identical manner to the EXPY. While the model has been mainly used to capture a total image of a country's export profile, it is also well suited to study a particular industry. In the case of this thesis that would be the forest industry.

There has been criticism against the EXPY indicator as well. Kumakura (2007) criticized the fact that $PRODY_k$ is defined as weighted average of Y_j, the GDP per capita of a country j =1,2, and $PRODY_k$ is linearly related to $EXPY_j$. When studying the relationship between $EXPY_j$ and nations' GDP per capitas, both $EXPY_j$ and Y_j are generally converted to logarithms. However, you can not really compare $\ln EXPY_j$ with $\ln Y_k$, since $\ln EXPY_j$ is not a linear function of $\ln Y_j$. It is a logarithm of a linear function of Y_j. (Sipilä 2008)

Kumakura presented an alternative method of calculating $PRODY_k$, which he called $prody_k$:

$prody_k = \sum_j ((x_{jk}/X_j) / \sum j(X_{jk}/X_j)) * \ln Y_j$

From $prody_k$ Kumakura could calculate $expy_j$

$expy_j = \sum_l (x_{jl}/X_j) * prody$

The $expy_j$ indicator represented a linear function of $\ln Y_j$, and could therefore be compared to it. To attain a value comparable with the $EXPY_j$ indicator of a country, one needs to calculate

the exponential function e^{expy}. Kumakura found that since real GDP per capita is distributed highly unevenly between countries, the $PRODY_k$ values for products were determined largely of the per capita GDP's of wealthy countries. This makes the EXPY values of poorer countries highly dependent on their income levels, and makes their export baskets look inordinarily sophisticated (Sipilä 2008). In Kumakura's comment on Rodrik's study on China's export sophistication, he found that using either Y_j or $\ln Y_j$ was highly meaningful to the end results.

2.3 Competitiveness through trade policy and tariff jumping

The meters of competitiveness discussed here focus on the export-led performance of a country's industries. The question remains: where does this competitiveness come from? The effects of abundant resources are undoubtedly beneficial, but there may also be a role for government policy in establishing a competitive advantage in certain areas.

Industrial policy has generally dealt with the government's role in promoting industries with potential. This promotion can take the form of tax exemptions, state monopolies, ensured raw materials, price controls, or other beneficial interventions. Industrial policy can also take the form of trade policy, where subsidies or taxes steer industry development in a certain way.

A very common case of industrial policy as trade policy to develop competitiveness is the infant industry policy of import substitution. By placing high tariffs on processed imports a country's internal industry is given an artificial advantage that may allow it to develop "in peace" from international competition. The lack of incentives for efficiency this creates are largely viewed as damaging to the genuine competitiveness of the industry, but import substituting methods are still fairly widely used in developing countries. Another example of artificial competitiveness-enhancing trade policy is the often used export-subsidy for certain products. Export subsidies may be in place to protect a large interest group, such as agricultural produces in the United States and E.U, which have also been protected with import tariffs. They may also be granted to provide domestic producers an advantage in exporting and hence widen their global market shares. A third method, and the most relevant to this paper, is the utilization of export duties, which will be discussed more thoroughly in the next chapter.

The economic theory likely to be most relevant to the Russian export taxes has to do with the concept of tariff jumping. By raising tariffs a country can motivate foreign investors can "jump" over tariff walls by investing in them. The most systematically presented model of the effects of trade policy on industrial structure is presented by Horstman and Markusen in their 1990 paper *Endogenous Market Structures in International Trade*. In it they study the effects of plant and firm specific costs and tariffs and transport costs from a two country, two product (which are imperfect substitutes) game theoretical perspective. In their analysis they found that manipulating the different cost variables (such as tariffs) had a notable effect on the ultimate market structure: on whether each country had one company and one plant that exported to the other, whether each company had a plant in each country, or if one company produced in both countries and the other didn't enter the market at all. The issue was originally raised by Robert Mundell in his 1957 paper *International Trade and Factor Mobility*, which concluded that impediments to factor mobility increase trade, and impediments to trade increase factor mobility. According to these papers a country's trade policy can have an effect on the structure of the industry that is formed, and on the movement of production factors (labour and capital).

Another aspect of increasing competitiveness through industrial or trade policy is the idea of technology diffusion, or learning from more experienced agents. Some believe that China has utilized this factor in its own economic development. The idea is to invite foreign investors, capital and companies to co-operate with domestic producers, and then to learn from them. This can be done by providing investors with lucrative duty-free arrangements, encouraging joint projects between foreign and domestic companies, or by utilizing market power and the exclusiveness of resources to force foreign companies to invest in the country. The last of these options can be partly attained by export taxes.

When studying competitiveness and export taxes in this paper it is good to remember that competitiveness is a very elusive concept, and the indicators developed for measuring it are still rather crude static images of a country's current level of exports. Indicators such as RCA and EXPY do little to measure the potential competitiveness of a country, but rather assume that that potential has already been realized and is therefore evident in its current export statistics. While this imperfection makes them very flawed instruments for measuring true competitiveness, their export-oriented approach means that they can be easily measured and

studied in conjunction with export taxes. Export taxes can be expected to have an effect on these indicators, and reviewing their current level can say something about the desirability of export taxes in a particular case (Russia).

3. Theory of export taxes

Abba Lerner's symmetry theorem is generally considered to be the fundamental starting point for theories on export taxes. The idea that an export tax can act symmetrically to an import tax enabled the analysis of this policy tool's effects against empirical evidence, and laid the groundwork for further analysis. Since Lerner, the theory of export taxes has been expanded to take into account multi-good, multi-country models, and the effects of imperfect competition. The following chapter will focus on the theory of export taxes, and the aspects of export taxes that are most important to competitiveness, and their utilization in the Russian roundwood sector.

3.1 Lerner's symmetry theorem

According to Lerner's (1936) symmetry theorem an ad valorem duty on exports in a two-country two-product static long term equilibrium acts in a symmetric way to an ad valorem duty on imports. The symmetry can also be expressed so, that for every ad valorem import duty there is an equal export duty that causes identical equilibrium production and consumption, and the same relative prices (McKinnon 1996). Lerner's symmetry theorem includes the assumption that trade between the countries is in equilibrium.

Let us assume, that country A that exports product X and imports product Y places an export tax T on product X. The domestic price of product Y remains the same as world price, but the domestic price of product X decreases below the world price (P^W).

The price relation between the products is at this point:

$$P^A_X = P^W_X(1-T) \qquad \frac{P^A_X}{P^A_Y} = \frac{P^W_X(1-T)}{P^W_Y}$$

The first equation tells that the price of product X in country A is the same as the world price of product X multiplied by the effect of the tax: (1-T). In other words the price of product X in country A falls below the world price. The second equation tells that the price of product X in country A falls compared to product Y because of the tax.

The end result would have been identical had an import tax been placed on product Y. Both an import and an export tax raise the price of the imported product compared to the exported product in the domestic market and if the exporting country is large, lower the price of the imported product in relation to the exported product in the world market.

The Lerner symmetry theorem only applies in sharply delimited circumstances, and hence it cannot fully be applied to the real effects of export taxes. Its value is particularly that it focuses on relative instead of absolute prices, and enables us to apply the theory of import taxes on exports as well. McKinnon (1996) extended the Lerner Theorem to apply to trade with three commodities. McKinnon showed that with two countries and three products, where a country imports 2 and exports one product, an import duty to one product is equal to an export duty to the exported product and a subsidy to the other import. Ray (1975) on the other hand showed that the findings of Lerner and McKinnon were not robust in the case of imperfect competition. According to Ray, even though export and import duties caused the same relative prices, imperfect competition and changing terms of trade cause the effects to differ. Blanchard (2005) places 3 requirements on the materialization of the symmetry:

The collected export tax is distributed to the consumers in the country
The export tax and import duties are not prohibitive to trade
An imbalance of trade between countries is not dependent on whether an export or an import tax is used

Blanchard's first requirement has to do with the fact that when trade is imbalanced the revenues from export taxes will differ from those collected from import duties. As long as the government distributes the revenue to the consumers or uses the revenue in a manner identical to the consumers, the symmetry holds. Blanchard's second requirement is already present in the original theorem: the symmetrical effects only apply in a situation where there is trade.

Particularly the third requirement proves difficult to fulfil because of investments between countries. According to Blanchard, whether an export or an import tax is used has an effect on the profits collected by foreign investors in the country. Both relative and absolute local prices affect revenues from investments. The effects of an export tax differ in terms of absolute local prices from import duties, so the balance of trade between countries is rocked depending on the instrument used (Blanchard 2005). The first and third requirements are rarely fulfilled in international trade, and even the second one is on very shaky ground when talking about Russia's export duties. Regardless of its limitations, the basic idea of the symmetry theorem is quite intuitive: export taxes decrease exports and therefore direct production into the domestic market, lowering its relative price there but heightening it elsewhere.

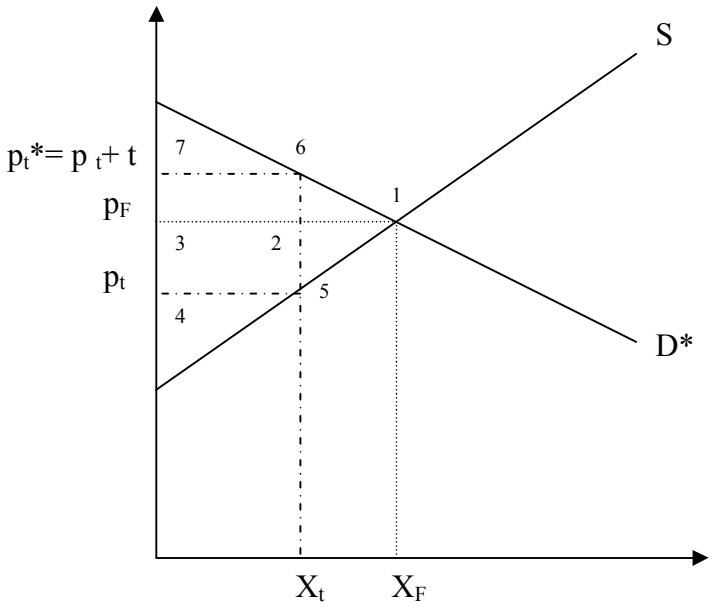
3.2 The effects of an export tax

An export tax is a restriction on a country's exports. They are mainly placed on raw materials, the exports of which a country wants to reduce to develop its foreign trade in a favourable direction. The effects of an export tax can be separated based on whether the setting country is a small or a large player in the exports of the good/ raw material in question. To a small country the effects of an export tax are unequivocally negative, while a large country may benefit from an export tax through an improvement in its terms of trade. Terms of trade refers to the price of the country's exports compared to the price of imports. Export taxes are relatively rare compared to import taxes, and they have mainly been used by developing countries. One reason for this is that they are often large exporters of raw materials. One reason for the relatively weak results attained through export taxes may also be that these developing countries rarely posses the market power necessary to truly benefit from them.

The effects of export taxes may be divided into welfare-effects and distributional effects. Welfare effects refer to the effects of the export tax on the exporting country, the importing country, and aggregate welfare. The distributional effect refers to the redistribution of revenues to different sectors inside the countries. The welfare effect is formed by the effects on the countries' terms of trade, and efficiency. The terms of trade effect of an export tax may be ambiguous but the efficiency effect is always negative. Efficiency refers to how efficiently countries allocate inputs to gain maximum utility.

If the exporting country is large, placing an export tax may have an effect on a product's world price. When the price rises, the terms of trade of the product improve for the exporter. The higher world price for the product lowers demand, however, and hence demand has to move to the domestic market, where a price below world price is paid. At the same time the country's efficiency suffers as the production of the exported good decreases because of fallen demand and inputs move to originally less productive sectors. The effect of an export tax on the importing country is unambiguously negative as both its terms of trade and efficiency suffer as it is forced produce the previously imported good at higher cost. (Piermartini 2004).

Figure 1: The effects of an export tax on a large country



Source: Helpman & Krugman 1989

Figure 1 illustrates the effect of an export tax on a large country that faces elastic world demand (D*) and has a supply function S. If a tax is levied at the rate t, the production of the good falls from X_F to X_t and internal price of the good in question falls to p_t. This reduces the sum of producer and consumer surplus by the area 12345. However, the tax yields government revenue of 4567. Hence a tax which keeps the trade distortion triangle 125 smaller than the rectangle 2376 provides the country with a net welfare gain.

3.3 An optimal export tax

If the exporting country has monopoly power in world markets we can calculate an optimal export tax for it. An optimal export tax maximizes a country's benefits in the terms of trade by utilizing the price elasticity of world demand and therefore works in exactly the same manner as an optimal import tax.

If the demand price elasticity of an exported product is d_a, an optimal export tax is simply $T^* = \left| 1/d_a \right|$, meaning the inverse value of the exported product's demand price elasticity. When determining an optimal export tax critical issues are the market power of the taxing country, and the price elasticity of the demand for the product.

The demand elasticity (d_a) for exported product can be expressed as a function of aggregate demand elasticity (d), the market share of the exporting country (a), and the rest of the world's supply elasticity (s_0):

$$d_a = (d - s_0 (1-a))/a$$

and since the optimal export tax is $T^* = \left| 1/d_a \right|$
we get:

$$T^* = a/\left| d - s_0 (1-a) \right|$$

In practice the optimal export tax is higher the larger the market share of the exporter (a), the lower the price elasticity of aggregate demand (d), and the lower the price elasticity of the rest of the world's supply (s_0) (Lindert, Pugel 1996). An optimal export tax takes advantage of the exporter's market power, but does not take into account the possibility of counter-measures. In reality other countries can respond to export taxes with their own trade restrictions. Rodrik (1989) and De Santis (2000) have also shown that an optimal export tax should not really be calculated for countries, but for companies. An optimal result is achieved when export taxes vary depending on the companies' domestic and foreign market power. Rodrik also acknowledges, however, that the results of the investigation, which urge lower export taxes for large companies and higher ones for small ones, are not easily applied in practice. A basic

prerequisite for an optimal export tax is that it cannot be prohibitive to trade, meaning so high as to make trade unprofitable.

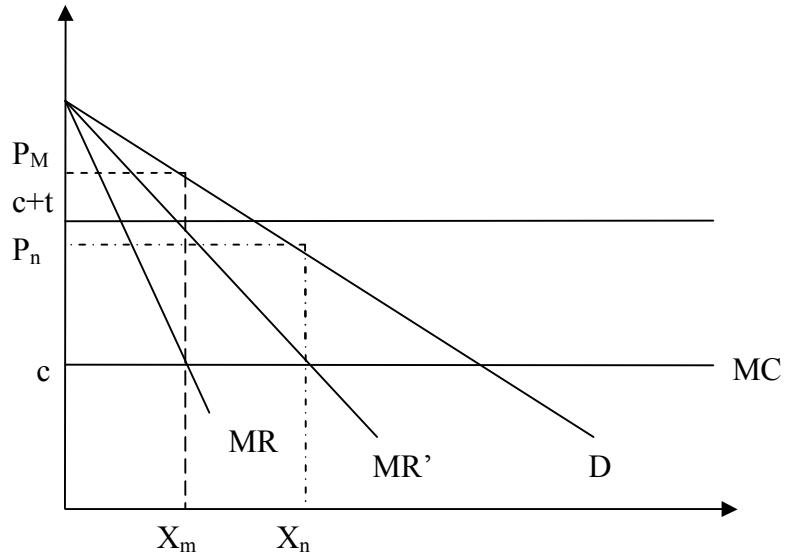
3.4 Export taxes as a means of strategic trade policy

Many economists have in past years consistently made the case for trade liberalization as a source for economic development and competitiveness. The effects of trade liberalization are by no means unambiguous however, and there have also been extensive studies on the role of strategic trade policy in the case of perfectly or imperfectly competitive industries and economies of scale. As these considerations are very relevant in the case of "real world" policy, it is worth studying how trade policy, particularly export policy might affect the welfare and competitiveness of a country's industries.

The pioneering work on the subject of strategic trade policy is Helpman and Krugman's *Trade Policy and Market Structure* (1989). In it they argue that in the case of a perfectly competitive market an export tax has a welfare-improving effect while a subsidy deteriorates welfare. The source of possible welfare-improvement arises from the export tax's terms-of-trade effect.

The welfare improving effects of an export tax are very much reliant of the competitiveness of a domestic industry. In a case where the foreign industry is perfectly competitive, we can see that the welfare improving effect of an export tax can also be achieved by monopolizing the particularly industry with a "national champion".

Figure 2: Profit maximizing behaviour of domestic firms in monopoly, oligopoly, or perfect competition



Source: Helpman & Krugman 1989

Figure 2 shows a situation where facing perfectly competitive industries abroad, domestic competition can either be perfect, oligopolistic, or a monopoly. If domestic competition is perfect, marginal revenues equal the demand curve. It is worth noting that this model is based in a situation where *there is no domestic consumption of the good in question, so the surplus of the domestic country is the surplus of the producers*. It can be seen from the Figure 2, that the producer surplus would be higher were the industry completely monopolized to a single unit, which would maximize surplus with P_M at X_m where its marginal revenue MR meets marginal costs MC. In a situation of perfect or oligopolistic competition it becomes clear that an export tax can attain this goal.

When focusing on the effects of export taxes in relation to the competitive nature of an industry it becomes necessary to define two concepts: perceived marginal revenue and true marginal revenue. Perceived marginal revenue is "the increase in revenue that a firm expects to receive by producing one more unit, which is always less than the price (because of intramarginal sales) but may exceed the true marginal revenue that would prevail if the industry acted in concert" (Helpman & Krugman 1989). The intramarginal sale decrease

refers to the lower prices the company expects to get as it increases production, but takes production by all other companies as given.

The importance of the perceived marginal revenue becomes apparent in the case of noncooperative domestic oligopoly. Here the marginal revenue perceived by firms is

$$MR' = p(X, p_1) + (X/n)p_1(X,p_1)$$

Meaning than in an oligopoly situation each firm maximizes its revenue not only taking into account the price of foreign imports, but also the output level of its domestic rivals. It is worth noting that the perceived marginal revenue curve is a weighted average of the true marginal revenue curve (MR(X)) and the demand curve (or inverse demand function p(X)).

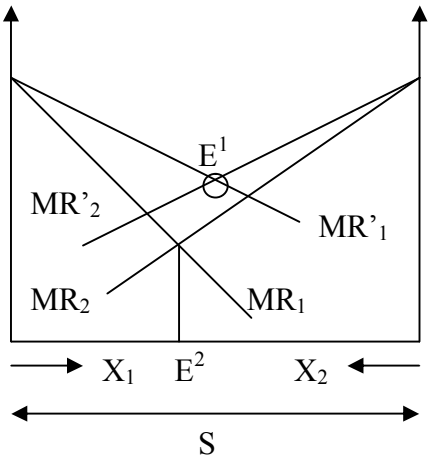
$$MR'(X,n) = (1-1/n)p(X) + (1/n)MR(X)$$

It this case the government can through public policy measures increase welfare by advocating an export tax, which causes the domestic companies to maximize their true marginal revenue. This can be seen in Figure 2, where the domestic oligopoly, if left to its own devices, would maximize its surplus by producing where perceived marginal revenue MR' meets costs c at X_n with price P_n. In this situation the government can add an export tax, which raises the companies' costs to c+t. Here the companies meet their cost function at the monopoly producing quantity X_m and charge P_M.

Krugman and Helpman further make the case that with free entry to an industry of increasing returns, aggressive export promoting policy has a more detrimental effect to welfare than an export tax. The case is particularly clear in a situation where free entry drives profits to zero. When a product is only exported, not consumed domestically, the welfare gain that results from its export is the profits net of subsidies and taxes earned by the exporter. With a free entry subsidies can never raise profits since additional entry into the industry will only drive the profits back to zero, and the subsidy will cost the government revenue. Once again the optimal policy is an export tax that maximizes government revenue.

The picture gets particularly interesting when we add resource constraints to the picture. I shall provide a single example of this.

Figure 3: Strategic trade policy with limited resources



Source: Helpman & Krugman 1989

Let us consider a model of two imperfectly competitive industries. The two industries are industry 1 with output (X_1), and industry two with output (X_2). Both industries compete for a single, limited resource: S. I have modelled here industry 1 production to be a more perfectly competitive industry, with perceived marginal revenue MR' far above true marginal revenue and hence close to world demand, and industry 2 to be a more concentrated industry, with perceived marginal revenue to be lower, closer to true marginal revenue. In equilibrium both industries are maximizing their perceived marginal revenues (MR'). In this case in principle both industries might be eligible for export tariffs, since both are currently producing more than they should. Were both to maximize true marginal revenue instead of perceived marginal revenue, however, resource distribution should move from E^1 to E^2, meaning the more competitive industry should produce less, and the more concentrated industry more.

It is clear that these analyses focus on a situation where there is no domestic consumption of the good, and hence provide us with an incomplete picture about the effects of strategic trade policy. In a situation with domestic consumption one has to take into account the desirability of a monopoly/oligopoly situation on the domestic market. I have earlier discussed the effects of an export tax on the domestic prices, pointing out the fact that the reduced exports should direct supply to the domestic market and therefore lower the price of the good under the export tax. An analysis of strategic trade policy under imperfect competition suggests a

somewhat different scenario, where the export tax lowers the production to such a degree where domestic consumers have to pay a higher price as well.

4. Export taxes in practice

Export taxes are generally viewed as a policy tool for developing countries. They have been used extensively on primary products with the aim of developing domestic industry, or to ensure the availability of raw materials to domestic consumers and producers. Among employed export taxes by developing countries are taxes on cotton in Pakistan, cashew nuts in Mozambique, roundwood in Chile, palm oil and forestry products in Indonesia, copra in the Philippines, vanilla, pepper and cloves in Madagascar, petroleum in Russia and sugar in Brazil. While they are generally used in developing economies, developed economies are not above using them either: in December 1995 the European Union imposed a $32 per ton export tax on wheat.

4.1 The arguments for export taxes

According to a study done by Roberta Piermartini to the WTO, the most commonly used arguments for export taxes are:

An export tax improves the terms of trade

In the case of a large country an export tax may improve the terms of trade. The improvement is reliant on many uncertainties, however. Importing countries are likely to respond to export taxes with tolls and tariffs of their own, and a long-term export tax may motivate the development of substituting products.

An export tax reduces volatility in domestic prices and export revenues

If a country is lacking in developed financial markets, export taxes can even out export revenues and make it easier to form long-term plans. The size of the taxes may also be dependent on the world prices of the good. When demand is high taxes can be raised, and during low demand the tax can even turn into a subsidy. The compensating effect of the export tax is reliant of the ability of the country's government to commit to long-term

economic policy, an uncertain assumption when considering of countries that do not even have developed financial markets.

An export tax reduces inflation pressure

An export tax lowers the home price of a product and hence reduces inflationary pressures. The inflation-suppressing effect of the tax depends on how important the good in question is to the total economy and consumption. The tax only reduces inflation to the extent that households consume the product in question. Furthermore, in an oligopolistic market the reduced prices never necessarily reach consumers.

An export tax protects and develops infant-industry sectors

An export tax can be implemented to protect domestic developing business sectors by creating an artificial competitive advantage for them. This is particularly true for the manufacturing sector, for which an export tax can guarantee lower prices for raw materials. An artificial competitive advantage may have the unfortunate side-effect of encouraging ineffective business practices, and it may decrease the real competitiveness of domestic companies. Export taxes can also be used to motivate foreign investors to invest in the country, but the uncertainties in trade policy that export taxes represent may be more likely to inhibit investments.

Export taxes may be a response to import duties for a country's exports

Many developed countries implement high import tariffs for processed goods, but have no taxes for raw material imports. The purpose of this is to import raw materials from developing countries and to protect domestic processing industries. With a tax on raw material exports developing countries can even out their terms trade. On the other hand the export tax will decrease investments into the taxed sector, and hence weaken the country's exports.

Export taxes provide a source of revenue for the government

Export taxes can act as an easy source of tax income for a developing economy. The problems arise regarding fluctuations in demand and market price for exported products particularly in raw materials markets, the main focus of export taxes.

4.2 Examples of export restrictions on raw materials

While there are many arguments for export taxes, and many rebuttals and uncertainties to those arguments, it may be beneficial to view few examples of implemented (or discontinued) export taxes, and the effects that implementation (or discontinuation) has had on the exporting country. Through their rhetoric in the international media, Russian legislators have made it very clear that the primary reasons for their placement of export taxes on roundwood are the protection of the national pulp and paper industry by reducing competition for raw materials, and luring foreign investments into the sector. While there are many uncertainties to how the export taxes will affect Russia per se, it is worth investigating previous export taxes placed on fairly similar products for the same reason.

4.21 Case Infant industry: Cotton and yarn markets in Pakistan

Darren Hudson and Don Ethridge carried out a study, *Export taxes and sectoral economic growth: evidence from cotton and yarn markets in Pakistan* (1999). Pakistan utilized an export tax on raw cotton fibre from 1988 to 1995. The justification for the export tax was the government's wish to develop the country's yarn industry, which used cotton as a primary input. The cost of cotton represented about 50% of the total variable costs in producing yarn. The export tax was used to reserve a larger quantity of cotton for the country's internal use, while lowering its price to domestic yarn producers.

The tax was based on a two-price system. The first price was a benchmark price, which was set periodically by the government, not the market. The second price was a minimum export price which was set daily by the government committee by using the benchmark price. This second price was always higher than the benchmark price and was highly correlated with the average world offer price of cotton.

In principle it appears that the export tax achieved its purpose: the production and exports of yarn increased while the exports of cotton decreased, and production of cotton increased at a slower rate than before.

Hudson and Ethridge carried out an econometric simulation of the Pakistani cotton and yarn market, where both sectors were analyzed separately under two different scenarios: a scenario

of free trade and the (true) scenario of export taxes. Their analysis of the Pakistani cotton and yarn sectors yielded some interesting results. First of all, the export tax had a significant adverse impact on the cotton sector, as prices of raw cotton decreased even further inside the country. The yarn sector of the country grew, but the contribution of the export tax on the growth (compared to the free trade scenario) was marginal at best.

There were two potential reasons for the lack of effectiveness of the export tax. First, the demand for cotton in Pakistan was highly inelastic, because (in the short run at least) there is very little substitutability for cotton in the yarn producing sector. This meant that yarn spinning mills did not significantly alter their consumption decisions regarding changes in cotton prices. This suggests a strong correlation between the effectiveness of the export tax and the demand relationship between the raw product and processing sector (Hudson, Ethridge 1999).

The second reason for the limited effectiveness of the export tax may have been the fact that Pakistan exported a large portion of its yarn production (from 30 to 70%), and that yarn production is a globalized industry with high volumes and low margins. While Pakistan protected its yarn spinners from global competition by effectively subsidizing cotton for them, the rest of the world was making cost-saving improvements and modernizations in production facilities. The below market price that Pakistan's yarn producers paid for their cotton acted as a drag on their own modernization and formation of true competitiveness. Therefore the growth the Pakistan yarn industry achieved now through price subsidies could have been achieved also by free market competition and investments into the spinning industry.

4.22 Trade liberalization effects: Cashew nuts in Mozambique

The trade liberalization of the cashew nut sector in Mozambique is another well documented case of export taxes, or rather their removal. Cashew nut production had been a strictly moderated sector in Mozambique until it engaged in negotiations with the World Bank to receive assistance. Some of the requirements that the World Bank presented to Mozambique in order for it to receive loans were that Mozambique privatize its economically unviable cashew processing sector and remove export taxes on cashew nuts. Until then the processing sector had been run by a government monopoly, and producer prices had also been fixed by

the government. Initially the government privatized the processing sector, and it phased out the export taxes a few years later.

Margaret McMillan, Dani Rodrik and Karen Horn Welch carried out a study of the trade liberalization in Mozambique *When Economic Reform Goes Wrong: Cashews in Mozambique* (2002), where they study the effects of trade liberalization on different agents in the industry, and focus on why trade liberalization did not work out the way it was planned. The important insight they have is that market structure (both domestic and global) has a huge influence on the effects of trade liberalization (or trade regulation).

The World Bank's rationale for removing trade restrictions on raw cashews is familiar from the economic theories presented earlier: the artificial trade restrictions caused efficiency losses because production inputs were directed to an uncompetitive processing sector. In addition to this, the export taxes hurt the country's cashew farmers, a poor lot to begin with, who were forced to sell their products to domestic processors at artificially low prices.

McMillan et. al take a look at the Mozambique sector by tracking the welfare of five distinct groups: raw cashew producers (farmers), traders and other intermediaries, owners of the cashew processing factories, workers employed in the factories and the government. The total utility of the cashew sector could be divided into the utilities of these five groups. The researchers pay particular attention to the farmers, since they were supposed to be the primary recipients of benefits from trade liberalization. The actual effects of trade liberalization could be further divided into the export quantity effect, terms-of-trade effect, unemployment effect, and trader's margin effect. The last three of these were to react adversely in the short run, but the export quantity was, by conventional economic theory, supposed to make up for this.

By using data of what the actual effects were and comparing them to how trade would have continued were the export restrictions to have continued in place McMillan et al. came to the conclusion that the export quantity rise and the welfare gain to the Mozambique farmers fell far short of what was expected. The reasons for this "failure" of the free markets can be found in the structure of the domestic market, the structure of the global market and the country's policies' credibility (or lack of).

First off, it was found that cashew farmers had very little market power in Mozambique. Cashew farmers generally had access to only one intermediary trader, who they would sell their crop to. These intermediaries needed a license to work, which acted as barrier to entry. After the export ban was removed, the number of traders increased somewhat – unlicensed traders also entered the market and gained a competitive advantage by not paying taxes. This increase, however, did not much increase the market power of the farmer. Furthermore, exports of raw cashews were also under license, and there were only 8 companies in the country that exported raw cashews. In other words, domestic buyers for raw cashews had vast oligopsony power, and because of licensing costs and informational asymmetries this oligopsony power was not really diminished by trade liberalization.

Secondly, the global market for raw cashews was far more concentrated than the market for processed cashew. Between 1990 and 2000 India bought 84% of the worlds raw cashew, giving it vast monopsony power over Mozambique raw cashew exporters. Since the processed cashew market was less concentrated, Mozambique processors were able to get a relatively better price for their products than raw materials exporters were.

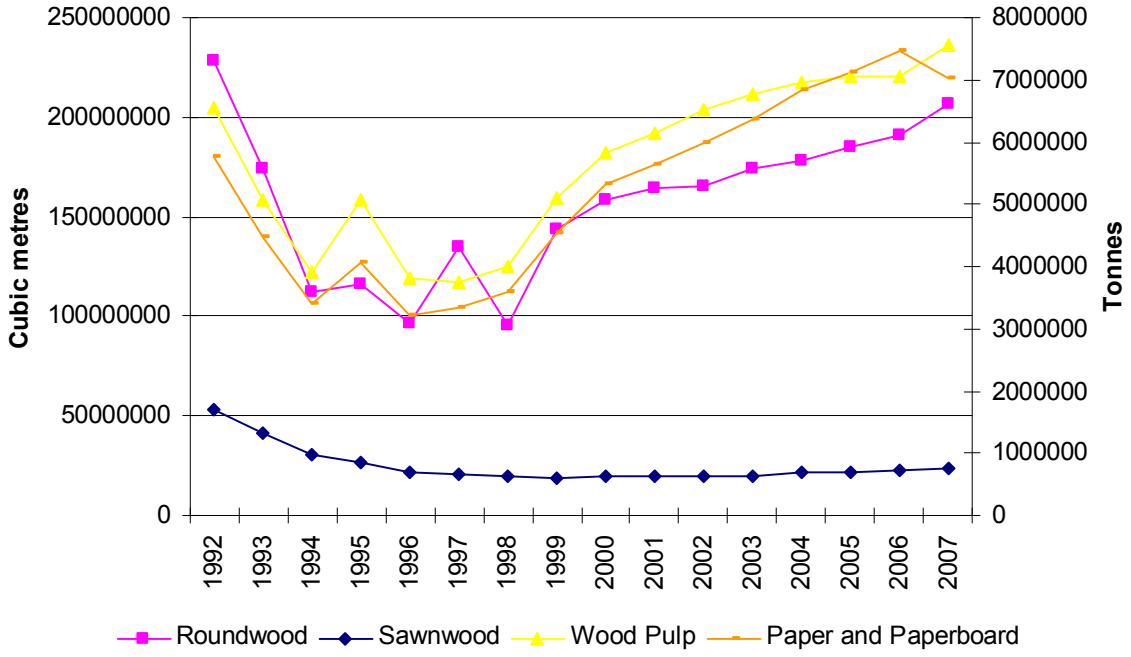
Thirdly, the trade liberalization had a massive adverse effect on the country's processing industry. In effect 10 000 people in processing lost their jobs. In World Bank calculations these people were expected to be employed elsewhere, but perhaps because workers did not believe in the longevity of trade liberalization they refused to employ themselves. The government was not able to credibly commit to trade liberalization and so workers stayed passive. This same belief may have led to the smaller-than-expected increases in cashew nut production. Cashew farmers only planted enough trees to replace dying ones, but production did not particularly increase. This may have also been because cashew production did not become a particularly more inviting industry after liberalization, as most of the benefits were eaten up by oligopolistic intermediaries.

The case of Mozambique does not study the effects of instituting export restriction, but rather removing them. Still, it is particularly illuminating because it focuses attention on a very important aspect: the structure of the domestic, and the global market. The role of imperfect competition on both sides of the border cannot be underestimated when assessing the effects of trade policy.

5. The Russian forest sector

Approximately 20 % of the world's forest resources are located in Russia, and industrial production from forest resources accounts for approximately 5 percent of Russia's total manufactures. The role of the forest industry varies greatly between regions. Particularly in North-West Russia the role of the industry is very large. Fifty percent of Russian forests is wood suitable for pulp production, 30 % is large logs for construction, and 20 % is wood fuel (Kyyrönen 2009). Of the total value of the forest sector approximately 43% is formed by pulp and paper, 40 % is formed by wood and wood products and 17 % by harvesting (Karvinen et al. 2005). Production in the forest industry fell sharply during the 1990's but has since recovered for nearly all production fields.

Figure 4: Production of different forest products in Russia 1992-2007



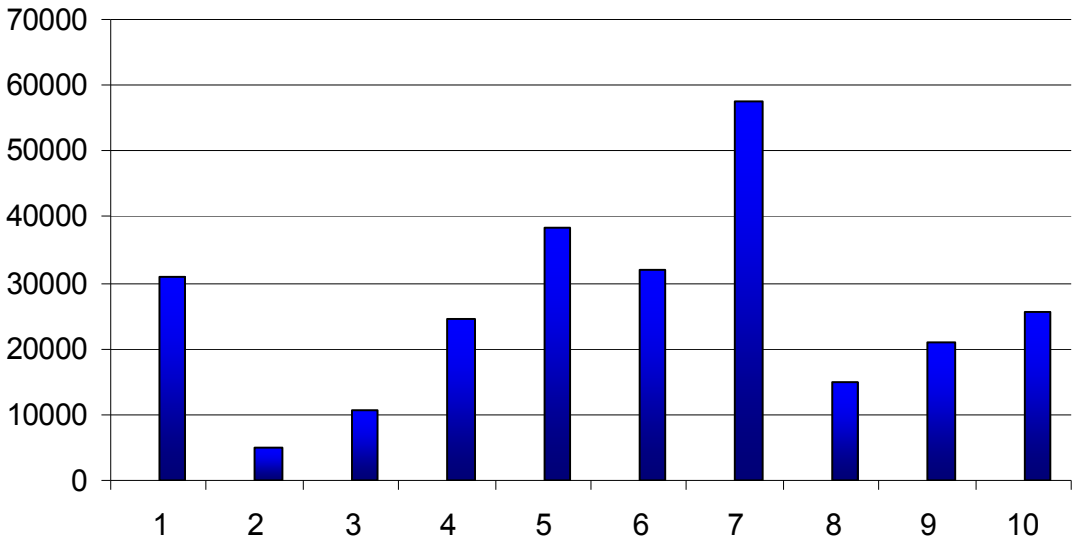
Source: Faostat

*Roundwood and sawnwood in cubic metres. Wood pulp and paper in tonnes

Figure 4 shows the development in different product categories' production from 1992 to 2007. While the production of most product groups has increased strongly since the 1990's, production is still pretty much at the level of 1992, and far lower for sawnwood. In addition to these product groups it is worth noting that production of certain other products, such as plywood, fibreboard, and veneer sheets has also increased notably in the past 10 years.

The forest industry has its roots in the Soviet planned economy, hence efficiency has been weak. After the collapse of the Soviet Union the forest industry suffered from a collapse of internal demand and investments into infrastructure came to a halt. The field still suffers from very low efficiency. Figure 5 provides us with the value added per worker in different sectors of the Russian economy. The table leaves out the petroleum manufacturing industry, as its unusually high value (325 865 Euros) is in no way representative of the general level of manufacturing in Russia. Things that are worth noting about Figure 5 are the very low value added per worker in the manufacture of wood and wood products, and the fairly average level of value added per worker in the pulp and paper industry (with printing and publishing included) compared to other capital intensive manufacturing sectors such as machinery and equipment, electronic equipment, and transport equipment.

Figure 5: Value added per worker in different manufacturing sectors in Russia in 2007 (EUR)



1. Food products, beverages and tobacco
2. Textiles
3. Wood and wood products
4. Pulp and paper; publishing and printing
5. Chemicals, chemical products
6. Non-metallic mineral products
7. Basic metals, fabricated metal products
8. Machinery and equipment n.e.c.
9. Electrical, electronic and optical equipment
10. Transport equipment

Source: Rosstat, ILO

When comparing these values to those taken from EU countries, it becomes clear that most manufacturing sectors in Russia are badly left behind in worker productivity. The average

value added per worker in the pulp and paper industry in the EU-27 was (in 2005) over 110% higher than in Russia in 2007. For wood products the difference was 160 %. In Russia the equipment is old, labour productivity low and infrastructure tolerable at best.

The 1998 devaluation of the rouble and revitalization of global demand have turned exports of the Russian forest industry on an upward path, but profitability is still weak. An exceptional characteristic in the Russian forest industry is that the forests are owned by the federal government, and are only rented to companies. The rental times vary between 1-99 years, but because of the burdens set by a long rental time (the company is obligated to observe more sustainable harvesting practices and forest care in longer leases) most leases are below 5 years (Mutanen et al. 2005). Land ownership is a very political issue in Russia, and the government may directly or indirectly support domestic companies through lease contracts.

The further processing of the forest industry is fairly concentrated in Northwest Russia in the Arkhangelsk, Karjala, and Vologda regions. The industry is mainly focused on low value-added products, such as pulp, plywood, and newspaper. There are several major forestry conglomerates in Russia that carry out the whole manufacturing process themselves, from the harvesting of the wood to the production of paper or cardboard. The size of the companies is small on a global scale. The largest Russian forest industry company Ilim Pulp's annual sales turnover was USD 1,8 billion (2007). The same year the Finnish Stora Enso had an annual sales turnover of EUR 13,4 billion Euros, and the largest forest industry company in the world, International Paper had an annual sales turnover of almost USD 22 billion. The internationally small size of these companies tells little about their market power in their home market. Ilim Pulp is, according to its own information, the largest company in Europe in terms of forest resources and harvesting volume. The group's mills account for 65 % of Russia's pulp production, and 25 % of board production. (Ilim Pulp homepage).

The Russian pulp and paper industry is highly concentrated, and a dozen of the largest mills produce about 75 per cent of total production. The rest of the mills are usually small and outdated, and struggling with severe difficulties (Kortelainen 2004). With a few exceptions almost all of the major mills have joined investor networks such as Ilim Pulp (which controls the Koryazhma, Ust-Ilimski and Bratski pulp and paper mills (PPM)), Titan Group (Arkhangelsk PPM), Continental Management (Baikal PPM, Yenisei PPM), and Sveza Group (several plywood mills). Some large players that have not joined investor groups have been

sold to foreign investors. Examples of these are the Syktyvkar PPM, which was sold to South African Mondi Group, and Svetogorsk PPM, sold to International Paper. In short there has definitely been a consolidation of power in the forest industry in the past years. The fight for the ownership of these companies has been rough and has on occasion bordered on illegal activities. Many of the major players in the major groups have been active political figures in the past, and the companies are still considered to hold certain clout especially with local governments in the areas they operate.

The forest sector employs a little below 900 000 people in Russia and many operations are still carried out with manual labour because of relatively low labour costs. In 2004 Finland produced as much or more chemical forest industry products as Russia, but there were 9 times more people employed in Russia (Piispa et al. 2006). The labour intensity of the Russian forest sector is particularly visible in the harvesting and wood-working industries. Approximately 78 % of Russia's forest resources are located in the Asiatic region, and the other 22 % in the European region (Mutanen et al. 2005). Most of the eastern forest resources are left untapped because of insufficient infrastructure. Forest resources are best utilized in the northwest, where both harvesting and processing work at near full capacity (Piispa et al. 2006).

The competitiveness of the national forest industry is based on vast underutilized forest resources, decent infrastructure in the North-West, cheap energy and a well educated, fairly cheap workforce. (Karvinen 2005). Domestic demand has for now remained low, but it is expected to rise faster in the future. Investments into domestic capacity have also been low because of underdeveloped financial markets, the difficulty of attaining a loan, and the low interest displayed by domestic investors towards the forest industry when more lucrative sectors, such as energy and metals keep bringing in higher returns (Karjalainen 2005). The Russian market has attracted foreign investments, but the low protection the country's legislation offers acts as a burden on them. The weak infrastructure, heavy bureaucracy, differences in operational cultures, and uncertainty about the future are also restrictive factors (Karjalainen et al. 2005). Tradition from the Soviet Union has led to forest industry companies acting as mainstays for entire communities, providing employment for whole villages as well as public services and infrastructure. This wide version of corporate social responsibility means heavy added expenses for foreign investors.

The primary goods production of the Northwest Russian forest cluster was studied by Dudarev et al. in 2004 and is presented in Table 1.

Table 1: Primary goods production of the Northwest Russian forest cluster

Raw Materials	Intermediary products	Final products
Raw wood	Sawn Timber	Furniture
	Plywood	Tissue
	Market pulp	Sacks
	Sack paper	Folding boxes
	Newsprint	Writings
	Wrapping paper	Wallpaper
	Paperboard	
	Corrugated board	
	Wallpaper base	
	Tissue base	

Source: (Dudarev et al. 2004)

Since the Northwest area is the most developed in the country, and even it focuses mostly on raw materials or intermediary products, we can expect that the industry as a whole is still quite undeveloped.

5.1 Competitiveness of the Russian forest industry

Theories of competitiveness were discussed earlier in this paper. The most commonly used economic framework for studying the competitiveness of an export-oriented sector is the Ricardian model of comparative advantage and its variations. By utilizing export data attained from the UN Comtrade system we can make some rudimentary observations regarding what export products Russia currently has a comparative advantage in, and how this advantage has developed over time.

The Ricardian revealed comparative advantage indicator (RCA) was calculated as follows:

$$RCA_{ij} = \frac{X_{ij} / \sum_i X_{ij}}{\sum_j X_{ij} / \sum_i \sum_j X_{ij}}$$

The RCA compares the portion of a certain good in a country's export basket to the portion of that good in global exports. The products in which Russia has the highest RCA factor we're calculated in chapter (2-digit), heading (4-digit) and item level. Altogether RCA indicators were calculated for 216 items under 67 headings and five chapters.

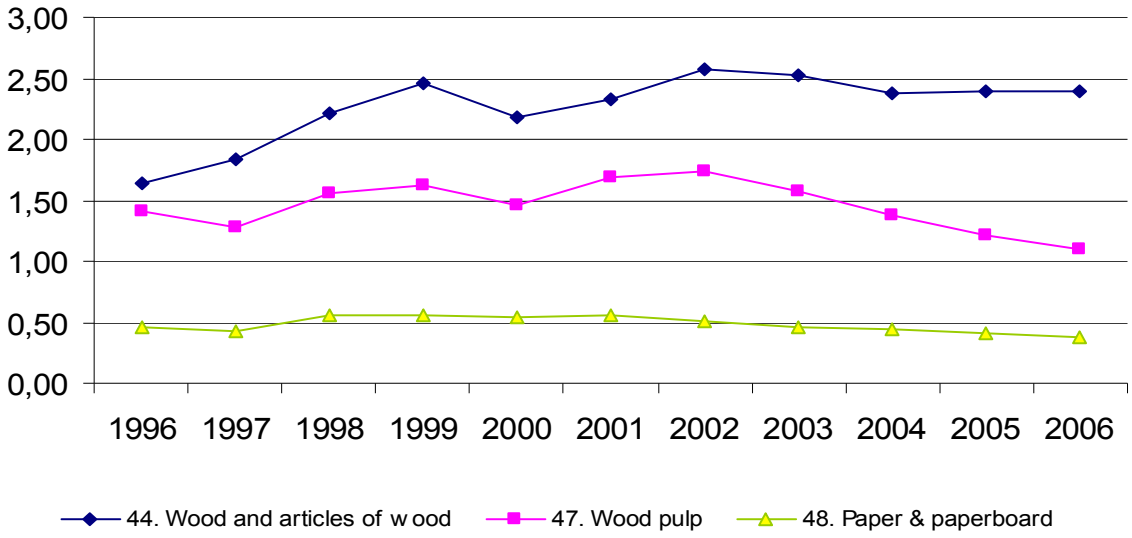
Table 2: Products with the highest RCA indicator in the Russian forestry sector in 2006

#	Headings	RCA
4403	Wood in the rough or roughly square	12,73
4406	Railway or tramway sleepers (cross-ties of wood)	5,10
4407	Wood sawn or chipped lengthwise	2,79
4801	Newsprint, in rolls or sheets	2,47
4702	Chemical wood pulp, dissolving grad	2,20
4704	Chemical wood pulp, sulphite, other	2,03
4412	Plywood, veneered panels and similar	1,78
4910	Calendars of any kind	1,54
4703	Chemical wood pulp, soda or sulphat	1,42
4804	Uncoated kraft paper and paperboard	1,16
#	Items	RCA
440320	Untreated coniferous wood in the rough	16,45
470411	Unbleached coniferous chemical wood pulp	14,90
440399	Wood, not elsewhere specified, in the rough	11,02
470311	Unbleached coniferous chemical wood pulp	9,30
440391	Oak wood in the rough	6,74
440610	Railway or tramway sleepers (cross-ties of wood)	5,67
441212	Plywood with >=1 outer ply of non-coniferous	5,58
440690	Railway or tramway sleepers (cross-ties of wood)	4,71
480421	Unbleached sack kraft paper, uncoated	4,06
441111	Fibreboard of a density >0.8g/cm3,	3,67

Source: Comtrade

As can be seen in Table 2, the most export competitive products in the Russian forest sector are products that require little processing. Untreated coniferous wood is clearly the most competitive products, but it may be somewhat surprising that chemical wood pulp is also a very competitive commodity. It pays to bear in mind, however, that in the forest sector unbleached chemical wood pulp is considered an intermediary product with little processing required.

Figure 6: The development of RCA in main product categories 1996-2006



Source: Comtrade

What can be seen from Figure 6 is that there has been a slight gradual decline in the RCA index of wood pulp and paper & paperboard, while the RCA of wood and articles of wood has remained comparatively stable after strong increases in the end of the 90's. Based on this it would seem that the Russian forest industry has shifted away from products with a higher added value and focused on products that require little processing. Naturally this is a very crude estimate, since there may be many other reasons for the (relatively) diminishing exports of wood pulp and paper from Russia. One likely reason is the reinvigoration of domestic demand for these products, especially since production of these has still risen (see Figure 4).

While the RCA indicators of different products provide us with a measure of what products Russia is currently competitive in, we need to also look at Russia's export basket relative to its standard of living. By calculating the EXPY indicator for the Russian forestry sector, we can compare the relative sophistication of Russia's wood products export basket to that of other countries, and get an idea of whether or not Russia "lags behind" in the level of sophistication of its wood products exports.

In the past the EXPY indicator has been used to look at the totality of a country's exports, and determine from there their level of export sophistication. In this thesis the focus is on wood exports, so the indicator has to be slightly modified. The data for the analysis was gathered

from the UN Comtrade database for the year 2006, before the first export taxes came in to effect. The products were divided based on the HS92 classification, because this yielded the most specific six digit commodity titles for the largest number of countries. The analysis included wood products export trade statistics for 128 countries, and 216 products.

While in the original $PRODY_k$ the portion of a certain good in a country's exports is compared to the country's total exports, in this analysis it is compared to the country's total wood products exports, meaning that in

$$PRODY_k = \sum_j ((x_{jk}/X_j) / \sum_j (X_{jk}/X_j)) * Y_j$$

X_j is actually the total value of the country's wood products exports. By making this change I'm avoiding artificially "punishing" countries for not exporting large amounts of wood products. The downside of this is that a large percentage of wood products exports as a portion of total exports might itself be an explaining factor of welfare (meaning GDP per capita). The same change applies to the calculation of the $EXPY_j$.

$$EXPY_j = \sum_l (x_{jl}/X_j) * PRODY$$

Since most countries did not report exporting every kind of wood product, non-reported wood products were assumed to be 0. This may of course be false, since underreporting may also be an indicator of export sophistication, or welfare. There is, however, no way of separating underreported exports from nonexistent ones.

Rodrik's model has been challenged by Kumakura (2007), who preferred using $\ln Y_j$ instead of Y_j in calculating $PRODY_k$, which he called $prody_k$. This thesis will include both variations in calculating $PRODY_k$ ($prody_k$) and $EXPY_j$ ($expy_j$) indices.

The first values to be calculated are the PRODY indices to the different wood products:

Table 3: The commodities with the highest and lowest $PRODY_k$ values

Highest		
Number	**Commodity**	**PRODY**
480210	Hand-made paper and paperboard	58385
441139	Fibreboard of a density >0.35g/cm3	55238
481121	Self-adhesive paper and paperboard	51611
480830	Kraft paper, creped or crinkled	44584
480260	Paper... (>10% of mechanical fibres)	38221
480253	Paper... (excl. mechanical fibres),	37103
481031	Kraft paper..., bleached, >95% chem	35125
481131	Paper..., coated... with plastics,	34247
480452	Kraft paper..., weighing >=225g/m2,	33004
481021	Light-weight coated paper for writing	32794
Lowest		
Number	**Commodity**	**PRODY**
481012	Paper..., coated with kaolin, etc,	5106
480523	Multi-ply paper... two outer layers	5094
480791	Straw paper and paperboard, in rolls	5094
482020	Exercise-books	4960
441291	Plywood, atleast one layer particle board	4739
441900	Tableware and kitchenware, of wood	4734
480710	Composite paper..., laminated	4536
480521	Multi-ply paper and paperboard	3890
442010	Statuettes and other ornaments	3778
440500	Wood wool; wood flour	2039

Source: Comtrade

The $PRODY_k$ values of different products vary wildly, from hand-made paper and paperboard with a value of 58 385, to wood wool and flour with a value 2 039. It is also clear, that there is a discrepancy between the actual "sophistication" of products, the amount of processing required, and the sophistication presented by the $PRODY_k$ values.

Table 4: The commodities with the highest and lowest $prody_k$ values

Highest		
Number	**Commodity**	**prody**
480830	Kraft paper, creped or crinkled	10,63
481121	Self-adhesive paper and paperboard	10,61
441139	Fibreboard of a density >0.35g/cm3	10,53
480210	Hand-made paper and paperboard	10,52
481031	Kraft paper..., bleached, >95% chem	10,40
470500	Semi-chemical wood pulp	10,35
481131	Paper..., coated... with plastics,	10,31
481021	Light-weight coated paper for writing	10,29
480260	Paper... (>10% of mechanical fibres)	10,27
470100	Mechanical wood pulp	10,26
Lowest		
Number	**Commodity**	**prody**
441219	Plywood, each ply =<6mm thick, nes	8,06
441299	Plywood, veneered panels and similar	8,03
491191	Pictures, designs and photographs	8,03
440820	Specified tropical wood veneer sheets	8,01
441291	Plywood, atleast one layer particle board	8,00
482020	Exercise-books	7,93
442010	Statuettes and other ornaments, of	7,88
440310	Wood in the rough..., treated with	7,65
482010	Registers, account books, order and	7,41
440500	Wood wool; wood flour	7,23

Source: Comtrade

The $prody_k$ values depict a lower variance, with the highest, creped or crinkled kraft paper, having a value of 10,63, and the lowest ,wood wool or flour, with a value of 7,23. In general the products with a high $PRODY_k$ value are also products with a high $prody_k$ value, with the top 10 of each sharing 8 commodities. The same cannot be said for the products with low $PRODY_k$ or $prody_k$ values though, as only 4 out of 10 commodities were shared between the different calculation methods.

After calculating the PRODY indicator we can use it together with the country/product market shares ($\sum_l (x_{jl}/X_j)$) calculate an $EXPY_j$ value for every country. By calculating the $EXPY_j$ with Rodrik's method we get the following high- and low-EXPY countries.

Table 5: The countries with the highest and lowest $EXPY_j$ values

Highest		Lowest	
Country	**EXPY**	**Country**	**EXPY**
Luxembourg	35281	Malawi	9605
Qatar	31196	Gabon	9109
Norway	24860	Uganda	8891
Finland	24117	Burundi	8783
Korea	22381	Mongolia	8423
Brunei	22339	Guyana	7932
Japan	21774	Cameroon	7741
Sweden	21486	Ghana	7696
Switzerland	20922	Gambia	6958
France	20799	Maldives	3778

Source: Comtrade

The countries with the highest and lowest EXPY indicators are hardly surprising, with high-welfare European countries representing the most export-sophisticated countries and underdeveloped African nations representing the least sophisticated wood products exporters.

The listing does not change much when calculating countries' expy values. Expy is here presented as e^{expy}, to easier compare it with EXPY. Once again Luxembourg, Finland, Qatar, and Norway lead the way. The lower end of the spectrum is more varied, yet most of the same countries are in the bottom ten of each calculation method.

Table 6: The countries with the highest and lowest e^{expy} values

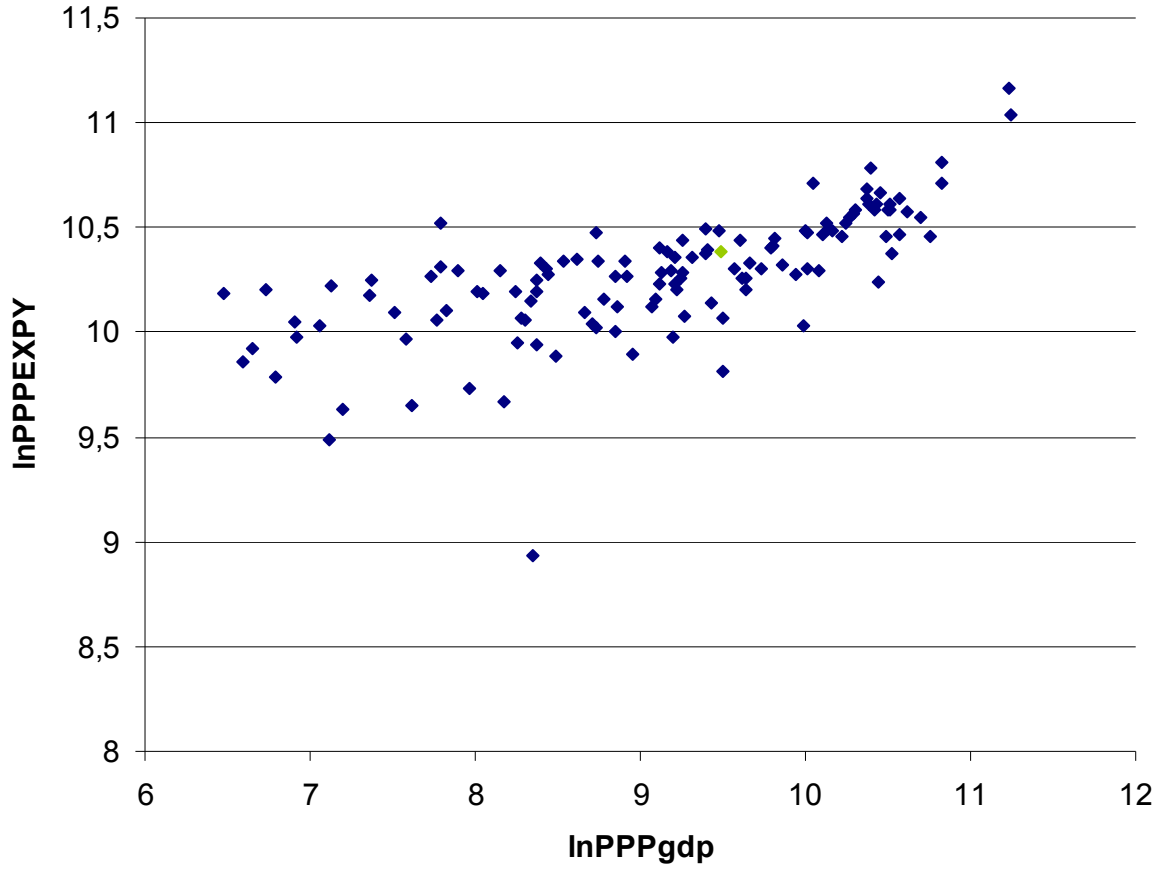
Highest		Lowest	
Country	**e^{expy}**	**Country**	**e^{expy}**
Luxembourg	21367	Namibia	4785
Finland	16860	Mongolia	4721
Qatar	16335	Cameroon	4445
Norway	15922	Malawi	4443
Korea	15712	Guyana	4160
Sweden	14626	Ghana	4102
Japan	14457	Uganda	4096
Bahrain	13739	Gambia	3146
Switzerland	13642	Burundi	2765
Canada	13484	Maldives	2634

Source: Comtrade

Finally, we can compare the EXPY values of different countries to their purchasing power parity corrected gross domestic products' per capita. These two are bound to have some correlation, since EXPY is essentially calculated utilizing the GDP per capita values. However, the large number of countries and products mean that a single country's GDP per

capita does not have much of an effect on the PRODYs of different products, and hence the relationship to EXPY remains limited in a mechanical sense. Russia is presented in the chart with a different colour marker.

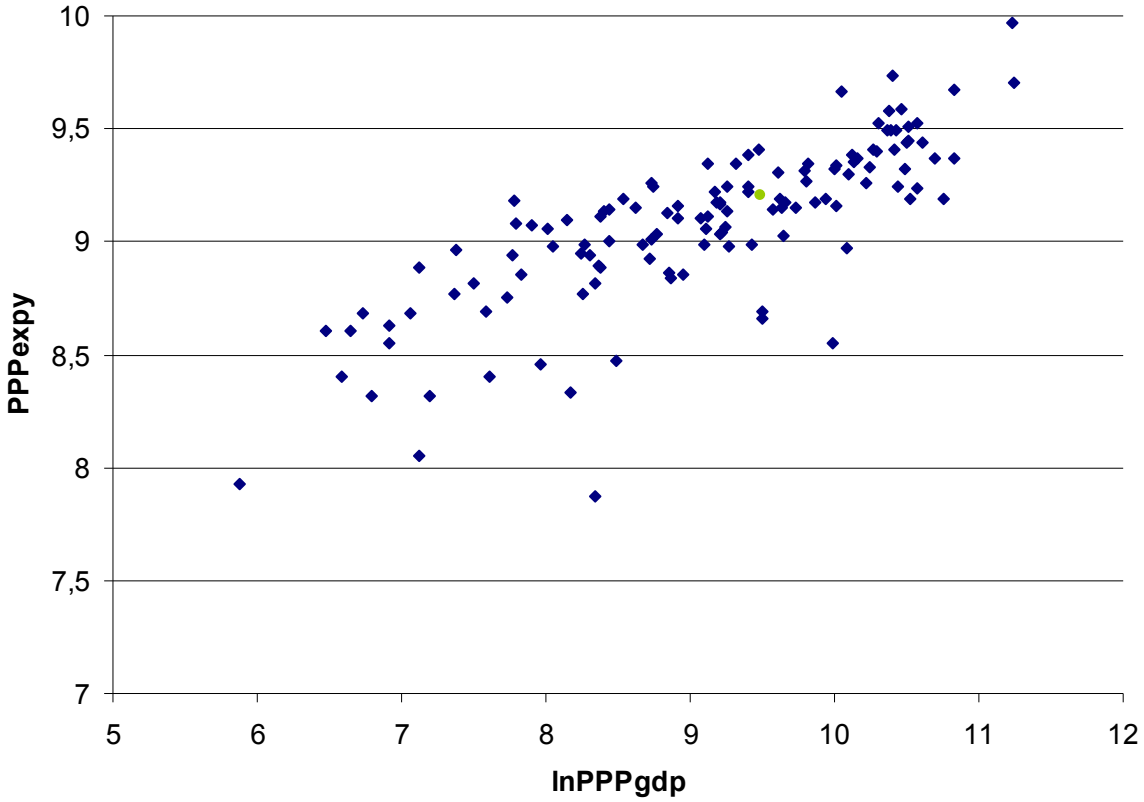
Figure 7: The relationship between GDP per capita and EXPY



The correlation coefficient between lnEXPY and lngdp is a fairly high 0,7, and we can see from figure 7 a clear trend of high GDP per capita countries having a similar export basket and likewise for low income countries, although the variance seems larger in their case of poor countries.

When looking at the comparison between lngdp and expy, Kumakura's modification to Rodrik's EXPY, the results are very similar:

Figure 8: The relationship between GDP per capita and expy



Since expy is originally calculated on utilizing lnY and hence it's variance is much smaller than EXPY's, there is no need to convert it into a logarithm (again). Basically the application of expy instead of EXPY increases the variance of the parameter somewhat, and increases the correlation between the two variables (from 0,7 to 0,79). It makes the trend between a higher expy value and a higher GDP per capita even clearer.

The point of interest in both of these figures is really the location of Russia. Russia's location on the chart has in both cases been market with a diverging colour. It's value in EXPY is (10.39, 9.49) and in expy it is (9.21, 9.49). In both cases the country is located near, but slightly above the trendline.

So what can we surmise from this? While Russia's forest product exports are not particularly developed, as could be seen from their RCA indicators, Russia has not been "left behind" in terms of modernization either. Russia's export basket represents the type of export basket a

country in that development stage would export. This does not mean that trade policy could not be used to improve Russia's situation, but it does mean that Russia's current level of export sophistication is by no means unusually low.

5.2 The world forest industry and Russia

The world forest industry has faced challenging times in recent years. Competition has been high, developing countries have increased production, and prices for paper have fallen. Somewhat surprisingly, according to a study conducted by Ernst & Young in 2007, high value-added processors have fared the worst in profitability. Market pulp producers and purchasers of paper products (such as publishers and commodity producers) have fared well, but paper producers have failed to benefit from their products' higher processing level. Most of the added value in the forest products industry is created in the beginning and at the end of the processing chain, and the role of paper and cardboard in the total value added of wood products is only about 5% (Ernst & Young, 2007)

Forest products production is a cyclical industry, and recent years have seen vastly expanding production capacity, particularly in developing countries in South America. This expansion has led to excess capacity, and the highly fragmented industry now faces pressures for consolidation. Consolidation pressures are further amplified by the sector's cyclical nature.

Another future challenge for the forest industry is the reduction is paper usage in many developed countries. Technological innovations such as computers and electronic databases have reduced paper's role as a medium for data storage. This development is likely to continue, and to spread to developing countries as well, as their technologies improve. The paper industry in Finland has in recent years focused more on packaging and on making new high-tech innovations from paper. These innovations may prove to be the future of the forest products industry, but this transformation will also require a notable transition period.

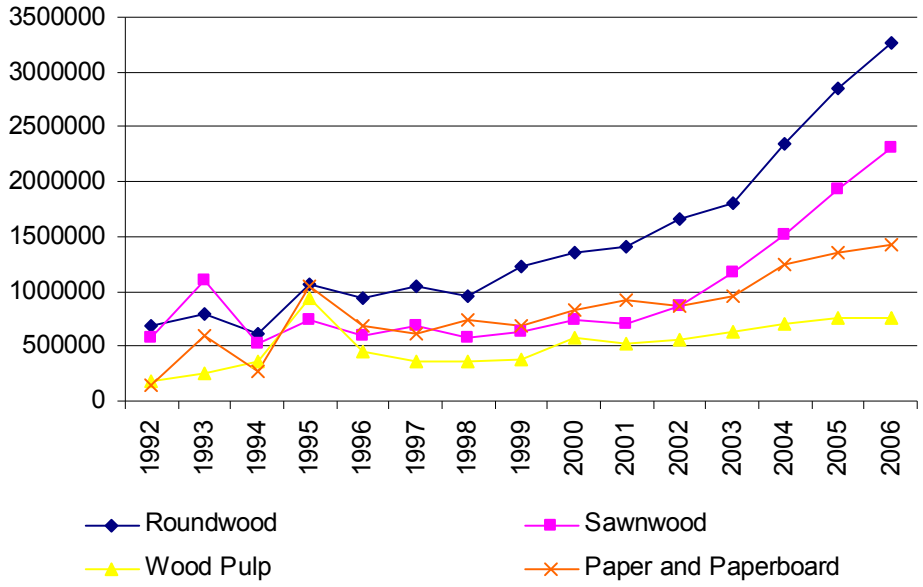
Russia has so far focused on the low end processing part of the forest industry: roundwood, sawnwood, and pulp. It is now attempting to transform its industry toward more value-added products, but it is a relevant question to ask whether this would necessarily even be desirable. Chapter 6.1 further highlights the relevance of this question by looking at the concentrations

of different levels of forest production. The aim to develop production toward higher levels of sophistication makes sense, particularly as Russia possesses vast natural resources and hence a natural advantage in the field. Still, the transition the industry currently faces may make a transition from raw materials to processed goods production unprofitable at least in the short term.

5.3 Exports of roundwood from Russia

Russia is the world's largest exported of roundwood. In 2006 Russia's exports of coniferous and non-coniferous roundwood accounted for 43,1% and 42,1,3% of world exports respectively. Russia's share in the export of these commodities has grown strongly since 1996, when Russia's share in world exports of coniferous wood was only 15,7%, and its share in non-coniferous exports was 19,1%. The largest purchasers of Russia's roundwood were China (37% of Russia's roundwood exports), Finland (32%), Japan (14%) and Sweden (6%) (Piispa et al. 2006). In the year 2002 approximately 30 % of Russia's roundwood exports were directed into Europe, and of this number over 80% go to Finland and Sweden. In 2006 27% of roundwood production and 72% of sawnwood production were exported. (Faostat, 2008)

Figure 9: Value of forest product exports 1992-2006



Source: Faostat

Especially China's demand is expected to rise, as China has limited its own loggings because of fears of the Yangtse flooding. Over 80% of Chinese and Finnish roundwood imports come from Russia (Roberts 2007). According to Russian producers the large foreign demand for roundwood has for its part weakened the development of Russia's own forestry sector, as local companies have to compete for the roundwood with foreign buyers. This perceived competition for raw materials can only be justified in North-West Russia, where the forest resources are highly utilized. For most of the country raw wood is amply available, it is processing capacity that is scarce. Russian producers of roundwood are, like the other forestry companies in the country, fairly small and unprofitable. One large reason for the lack of profitability is the earlier mentioned wide social responsibility left behind by the Soviet times (Mutanen et al 2005).

The exports of Russian roundwood can be divided into the exports of coniferous and non-coniferous roundwood. Due to the high price of coniferous wood, and domestic demand for the non-coniferous variety, most of Russia's exports is of the coniferous variety. For coniferous wood the bulk of exports goes to China, while Finland buys up 80% of the non-coniferous roundwood. Even though domestic demand has increased, particularly for birch, there's still surplus supply due to legislation, which binds tenants of mixed forests to fell the non-coniferous trees alongside the coniferous ones (Mutanen ym. 2005).

Roundwood as such is not a very profitable item to export. Transporting logs is relatively expensive compared to lumber, plywood and pulp. This is because the lumber extracted from logs is only about half of the volume of roundwood. In addition to this, dried lumber is lighter and therefore easier to transport. In most of the world roundwood is processed relatively close to where it is felled. This raises the question: why does Russia export so much of its roundwood?

According to a study by the Canadian Imperial Bank of Commerce (CIBC 2007) there are a few possible explanations for this. One is that there are foreign barriers to exports of more processed forest products from Russia. Russian Prime Minister Putin has repeatedly blamed more developed economies and China for restricting access of Russian manufactures in their markets. These barriers can also take the role of foreign subsidies on wood processing, which artificially make foreign wood processors more competitive. This may be particularly true with China. Another explanation is that manufacturing costs in Russia are simply too high.

This explanation is closely related to the competitiveness of the Russian forest sector. After years of no investment in fixed capital and little progress in production practices, the Russian forest sector simply cannot compete in processing with the low labour costs of the Chinese and the highly efficient mills of Europe.

As mentioned before, the structure of the logging industry is highly fragmented, with a large number of small logging companies operating regionally. The largest of these companies sell roundwood to directly to foreign producers, while smaller companies sell their product to intermediaries that organize the actual exports. In any case the number of buyers is not high: in North-West Russia a logging company faces approximately five buyers for its roundwood production, and North-West Russia is the most functional wood products market in Russia. When travelling eastward, the number of buyers falls, and the distance a company has to transport its logs if they want to consult another buyer rises rapidly. This is important because it highlights the relative lack of market power these companies experience compared to the trading partners. Many Finnish companies also have their own logging company in Russia that provide them with roundwood. (Kyyrönen 2009)

5.4 The politics of forest trade

In terms of trade policies the world forest industry is quite varied. The elimination of trade barriers involved in WTO negotiations has reduced them, but many countries still employ various domestic protectionist policies.

Trade restrictions if forest trade are not widely employed in the E.U.. Some E.U. countries do provide state aid to pulp, paper and wood processing products though, often in the form of grants, loans and loan guarantees for capacity expansion. Projects in Eastern Germany have been promoted as stimulus to economically depressed regions, but they also provide German manufacturers with an artificial advantage over their neighbours. The European Union has approved these projects under is “multisectoral framework on regional aid for large investment projects”. (AF&PA 2005)

In addition to investment subsidies the E.U. employs a wide array of technical requirements to wood product imports. While these technical requirements are primarily employed to prevent

either pest infestation or illegal logging, some trading partners view them as being unreasonably strict.

China has removed many of its tariffs in recent years, but it still consciously structures its trade policy to support industry development from unprocessed to processed goods. China has structured its tariffs to encourage imports of raw materials versus finished products, provides policy loans, subsidies and preferential tax policies to domestic enterprises to invest in forest resources, processing operations and capacity expansions, and has expanded its border trade value added tax provisions to allow for large increases in low cost wood imports (AF&PA 2005). This means that China compensates part of the increased roundwood tariffs to its saw mills.

India employs highly restrictive import tariffs with initial rates reaching upward of 40-60% and applied rates for most products linger at 30%. In combination, the tariffs and taxes and other surcharges result in a rate of 59,3% for veneer products and plywood and a rate of 35% for lumber imports. Higher import tariffs are attached to value-added products. (AF&PA 2005)

Japan has been very unwilling to liberalize its forest trade. Japan justifies high import tariffs on wood products on ecological grounds. According to Japanese representatives liberalized wood products trade would decimate forest reserves both inside and outside the country. Some of its implemented trade barriers have even been announced as attempts at meeting Kyoto protocol obligations. Aside from import tariffs, Japan also employs subsidies to its domestic industry, and restrictive codes that reduce its timber imports.

Despite Russian claims that Finland has effectively banned the exporting of roundwood, Finland actually does not employ trade barriers in forest products trade. Finland has no tariffs, quotas, or bans in place for any forest products.

Russia's own forest trade policy has varied greatly over the years. During the Soviet Union forest product prices we're negotiated biannually with trade partners, and trade was based on that. Finnish procurement of roundwood from Russia was negotiated through a Finnish trading house called Thomesto until 1990 (Kyyrönen, 2009).

After the collapse of the communist system prices have been determined more or less by market forces. Russia initially attempted a roundwood export tax in the 90's, but taxes were quietly dropped as there was insufficient domestic demand for domestic production, particularly in non-coniferous logs. For a long time Russia held an export tax for sawnwood, which was only dropped in 2008. In 2008 Russia implemented an import tax for eucalyptus pulp, apparently to protect its domestic market from Asian pulp producers. There is also an import tax on paper, and in the beginning of 2009 Russia extended an import tariff on forestry tractors, which are used to fell and transport logs. This may be in part another restriction on the logging companies, or merely a way to support domestic machine building, such as the Onega Tractor Plant. (Kyyrönen 2009)

5.5 The Russian roundwood export taxes

Counsellor Hannu Kivelä presented the following schedule for the implementation of roundwood export tariffs in Russia:

Table 7: The schedule for roundwood export taxes

01.07.2007	20% minimum 10 euros/m^3, applies to spruce, pine, and over 15 cm birch 10% min 5 euros/m^3, applies to aspen
01.04.2008	25% minimum 15 euros/m^3, applies to spruce, pine, and over 15 cm birch 10% min 5 euros/m^3, applies to aspen
01.01.2009	80% minimum 50 euros/m^3, applies to spruce, pine, aspen, and over 15 cm birch*
01.01.2011	80% minimum 50 euros/m^3, applies to spruce, pine, aspen and birch*

Source: Kivelä (2007)

*postponed for now

Representatives of Russia have reported that the main reason for increased export tariffs is to motivate foreign investors to invest in Russia. Despite its possession of the worlds largest forest reserves, the country's forests are badly underutilized and infrastructure is old and worn down. By raising export taxes the government believes it can get foreign companies to invest in processing operations inside the country.

In his annual speech in 2007 the former president of Russia, Vladimir Putin, expressed his concern over the utilization of Russia's natural resources. In his speech Putin worried about whether the country's vast natural resources are used in a way that will enrich future generations of Russians. One way to ensure this is to develop further forestry processing manufacturing inside the country. The export tariffs are supposed to secure supply for domestic companies, which currently suffer from heavy external demand for roundwood. In addition to roundwood export tariffs the government plans to lower import tariffs for forest manufacturing technical equipment and to initiate co-operation projects between the government and foreign enterprises to strengthen the much needed infrastructure (Putin 2007). In another speech to Russian forestry companies Putin criticized other countries unwillingness to let Russian companies enter their markets and hence tried to justify Russia's export taxes as a countermeasure to other countries' barriers to trade (Roberts 2007). Putin's speeches suggest that Russia will supervise its resources more closely in the future.

Since the forest resources in Northwest-Russia are almost completely utilized, and the area is also home to further processing, the export taxes are likely aimed to affect the eastern part of Russia, with its vast underutilized forest resources, poor infrastructure, and geographic closeness to China. China's demand is expected to rise, and Russia wants to take advantage of its position in relation to its largest buyer.

One of the major reasons for export taxes may also be to deter illegal logging. Illegal loggings are a notable problem in Russia. There have been various estimates as to their effect, but various independent organizations (Greenpeace, WWF) have estimated illegal loggings to account for 20-30% of Russia's fellings, though official numbers are much lower. Placing an export tax would make it more difficult to move across the border, while lowering its domestic market price would make it less profitable to log illegally.

In November 2008 Russia's Prime Minister Vladimir Putin announced that Russia would postpone the third stage of roundwood export duties out of concern for their effects on Finnish employment. Mr. Putin's explanations were widely regarded in Finland as an attempt to garner points for a political move that was necessary in any case. Due to the global financial crisis foreign investors have put new (and even existing) investments on indefinite hold. In this investment climate the tariff was unlikely to succeed in luring foreign investors

into Russia, one of the main reasons for its original implementation. The tariffs already imposed stay in place, and a later rising of the tariffs cannot yet be counted out. Mr. Putin has announced that Russia will continue to strive to develop domestic processing industry.

6. The effects of export taxes on Russia

Russia implemented the initial round of export tax increases in July 2007, adding a 20% (or minimum 10 euro) increase on spruce, pine, and over 15cm birch, and 10% (minimum 5 euro) tax on aspen. The effects of this increased tax can already be seen in the trade statistics of 2007 both as increased unit prices and reduced exports. Finnish forestry companies very quickly started to look for available wood sources elsewhere, mainly increasing domestic purchases. As the Finnish forestry market is quite developed, however, there was not much room for capacity increases.

Between 2006 and 2007 the exports of coniferous and nonconiferous industrial roundwood both fell by approximately 3,5%, while the exports of sawnwood increased by 8,6%. The reduced export demand for roundwood benefitted Russian saws the most, as roundwood prices make up the bulk of their raw materials costs. By spring 2009 the roundwood export taxes have had a notable impact on the felling quantities in Russia. Finnish forest companies usually make advance payments for future wood deliveries in the previous summer, and wood is felled in the winter months. Because of the export taxes Finnish companies have refused to sign new contracts, so wood goes uncut in Russia. (Kyyrönen, 2009)

The effects so far have been amplified by the global economic crisis, which has rapidly reduced demand for wood products, especially for construction purposes. Wood processors in Europe are reducing capacity, putting existing investments on hold, and are certainly not making any new investments in Russia or elsewhere. Before the financial crisis the Russian sawmilling industry experienced a brief period of rapid growth as its raw materials prices fell and demand remained high in the U.S. housing market. As the financial crisis gripped the U.S. and Russian loggings contracted rapidly, this benefit was also lost.

Because of the roundwood export taxes, Exported Russian wood is currently somewhat more expensive than its Finnish counterpart. This has naturally made it economically unviable for

Finnish purchasers to buy Russian wood. Exports into China have not fallen quite as much as with Finland, partly because China subsidises the imports of roundwood through tax benefits. (Kyyrönen, 2009)

In 2008 Turner et al. published a research paper *Implications of the Russian roundwood export tax for the Russian and global wood products sectors*. In it they utilized the Global Forest Products Model, an econometric model created to estimate global supply and demand ramifications for different kinds of wood products. According to their simulations, the softwood export tax would reduce Russian roundwood exports by 50% and roundwood prices in Russia by 16%, but increase the Russian domestic consumption of industrial roundwood by only 1,9%. Revenues from all Russian forest products exports, including roundwood would decrease by 23%, and the revenue of all Russian forest industries would decrease by 14%. The main reason for this rather pessimistic conclusion is that Russian manufacturing costs are relatively high, and the reduction in roundwood price would be insufficient to increase the wood manufacturing sector's competitiveness. (Turner et al. 2007)

In the spring of 2009 Russia was planning to remove roundwood export taxes from companies that invested into Russian production. This might lure new investments into the country, but it would also treat companies that have already invested in Russia quite unfairly.

6.1 Similarities and differences with other cases of restrictions on raw materials exports

There were two cases of previous raw materials export restrictions that were examined in this thesis. One was the export tax placed on cotton to support the yarn market in Pakistan, and the other was the trade liberalization of cashew nuts in Mozambique. There are similarities and differences between these two cases and the Russian export tax on roundwood, and those factors may be a determining force in how effective the Russian export restrictions will prove to be.

The Pakistani export tax on cotton was primarily placed to develop the country's yarn sector. While on the surface this policy worked, an econometric analysis on the effects carried out by Hudson and Ethridge (1999) showed that the additional positive effect the trade policy had on

the yarn sector was negligible, while its adverse effect on the cotton production was far more severe. There were two stated reasons for this:

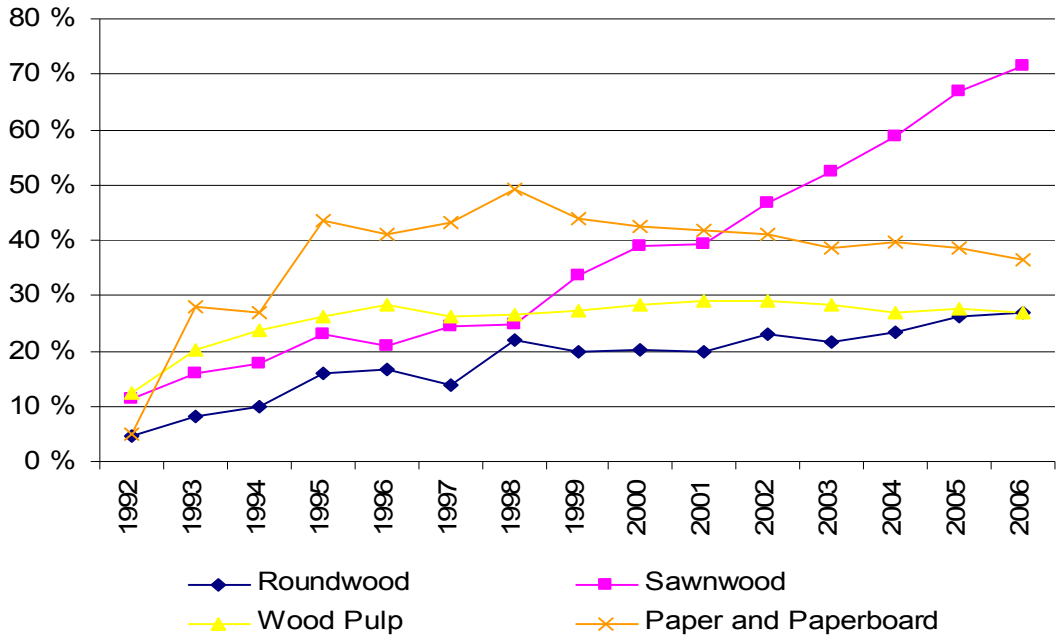
1. Demand for cotton in Pakistan was highly inelastic.
2. A large portion of yarn production in Pakistan was exported, and yarn was a uniform good with a globalized market.

We can now ask whether either of these two hold true for Russia. In the case of paper and pulp production, we can assume that his holds true to some extent. Investments into new production capacity are slow to take effect, and so it's unlikely that their demand for logs will increase rapidly because of lower prices. The only place where this may happen is in North-West Russia, where the domestic producers are genuinely competing for the same raw materials with western processors. There is no reliable information available on the capacity utilization level of current Russian pulp and paper mills, so it is possible that these mills may be able to increase production without new investment into infrastructure.

The case may be somewhat different for sawmills, which require less of a capital investment to increase production. As mentioned before, they are the primary beneficiaries of low roundwood prices as raw materials prices constitute such a large part of their total costs. There has already been evidence of domestic roundwood demand increasing rapidly as saws take advantage of low log prices and the suddenly halted foreign demand for roundwood.

The second reason why the Pakistani cotton export tax did not work was because a large portion of yarn production was exported. Figure 10 provides a view into the share of production that is exported for various important product categories. While the exports of roundwood in terms of quantity are far higher than with sawnwood, a larger portion of the production sawnwood and paper and paperboard are actually exported than is the case with roundwood.

Figure 10: Share of wood production exported 1992-2006



For sawnwood over 70% of production is exported, and even for paper this number is near 40%. This means that all of Russia's wood processing sectors are dependent on the world export markets. Furthermore items such as sawnwood, paper, and wood pulp are all rather uniform standardised products with fairly small regional differences. This leads to the conclusion that these processors may all benefit from the subsidy that an export tax on roundwood provides. It also means that this artificial benefit may, much like in Pakistan, hamper these industries from making cost-saving improvements in a very globally competitive industry.

The case of cashew nuts in Mozambique was somewhat different in the sense that it studied the effects of trade liberalization, the effects of removing a trade barrier. Regardless of this, the case in question is insightful in examining the structure of the domestic industry and the global market for the product as the primary factors that determine the effects of trade policy. The major affecting factor in Mozambique was imperfect competition on both a local and a global scale. This manifested in two ways:

1. The power-relation between raw materials producers, traders and processors.
2. The global concentration of the raw-materials market compared to the processed goods market

According to Dudarev et al. (2004) in Northwest Russia the main elements of the forest cluster are forestry and harvesting, mechanical wood-processing, and pulp and paper. Forestry and harvesting companies make up a uniform high-density network of rather small companies with revenues of approximately 100 000$ per year. The mechanical wood-processing companies are generally also small with a local importance, and finally there are some large mechanical wood processing and pulp and paper companies that operate regionally or even nationally (through groups).

According to a study done by CIBC in 2007 the five largest logging companies account for less than 10% of the total fellings in the country and the bulk of the harvesting is done by some 20 000 logging and harvesting enterprises. (CIBC 2007)

In Russia there does not exist a national market for wood. The Northwest Russian forest cluster is the most developed part of the national industry; elsewhere undeveloped infrastructure means that markets are very much local. This does not provide forestry and harvesting companies with a high degree of market power either. This market power will be further diminished by the export taxes, as they are denied the possibility of exporting their products.

The key question in comparing Russia and Mozambique is how much do Russian forestry and harvesting companies benefit from exporting roundwood? And would the Russian forest industry benefit from a better competitive situation if it graduated to products with a higher added value. This question may be partly answered by looking at the global concentration of import markets for different wood products. This can be done by utilizing measures commonly used to study industry concentration: the Concentration Ratio and the Herfindahl Hirschman Index. The concentration ratio measures the market share of the m largest companies (or in this case, countries) in total wood imports. The Herfindahl Hirschman Index on the other hand sums up the squares of all the countries' market shares in a particular industry. A higher Concentration Ratio or Herfindahl Hirschman Index implicates a higher concentration.

Table 8: The concentration of imports for different wood products (2006)

	Industrial roundwood (total)	Industrial roundwood (C)	Industrial roundwood (NC)	Paper and paperboard	Wood pulp	Sawnwood
CR_4	0,52	0,53	0,58	0,37	0,54	0,49
HHI	1022	1004	1245	507	940	1164

Source: Faostat

From table 8 we can see that according to the Concentration Index the world import market is most concentrated for nonconiferous industrial roundwood, while the paper and paperboard market is the least concentrated. Results are similar with the Herfindahl Hirschman Index, with some notable exceptions. Sawnwood scores the second lowest concentration ratio but the second highest HHI, while wood pulp has the second lowest HHI but second highest concentration ratio. From this we can tentatively state that the Russian forest industry faces less concentrated demand were it to develop its exports mainly towards paper products. The development of exports toward sawnwood (as has mainly happened so far) and wood pulp may not benefit the country much in improving its market power.

The concentration of demand is not the only determining factor in market attractiveness. While concentrated demand is an adverse feature to an exporter, concentrated supply is not. Russia can better utilize monopoly power in exporting products which have few suppliers, or a higher concentration of exports.

Table 9: The concentration exports for different wood products (2006)

	Industrial roundwood (total)	Industrial roundwood (C)	Industrial roundwood (NC)	Paper and paperboard	Wood pulp	Sawnwood
CR_4	0,56	0,66	0,49	0,42	0,57	0,56
HHI	1664	2119	1167	644	1119	1177

Source: Faostat

The export concentration of different wood products points Russia towards another direction concerning the attractiveness of different wood products markets. The paper and paperboard international market, in addition to being the least concentrated in demand, is also the least concentrated when it comes to supply. The only product gategory where concentration is above a moderate level (1000-1800 according to the United States Department of Justice), is the exporting of coniferous roundwood, in which Russia held a 43% world market share in 2006.

Looking purely at the supply side concentration it would seem beneficial for Russia to concentrate on coniferous roundwood, as it holds substantial market power in the exports of that good. Regardless of this, the supply side concentration should not be taken at face value. While industrial roundwood exports are concentrated around Russia and a few others, this may not be so much a reflection of their market power or comparative advantage as it is a reflection of the unprofitability of roundwood exporting. Most developed countries utilize domestic wood production themselves, processing it into higher value-added products.

6.2 The welfare effect of export taxes on Russia

As previously discussed in the theory of export taxes the welfare effect of an export tax on Russia depends highly on the market power the country has in the world market for roundwood. As Russia is the world's largest exporter of roundwood, with an estimated market share of over 40% in total world roundwood exports (2006), one can safely assume it to hold notable market power in the field.

According to trade theory, a country can benefit from placing an export tax by improving its terms of trade. For this improvement to take place, however, that country has to be a "large" country, in that the demand that it faces for its products is elastic. In this very simplified framework it would seem after looking at the Russian forest industry and the market power it holds in roundwood, that Russia could certainly benefit from placing export taxes on the commodity.

The basic expectation would be that the revenues the government collects from exported logs and the lower prices domestic consumers pay for their supplies more than make up for the producer surplus loss incurred by an export tax. This can only be true if the export tax placed is not prohibitive to trade. The final 80% export tax, which is currently placed on hold, may effectively end log exports from Russia. This would mean that the government would get no revenues, producers would lose the whole producer surplus, and domestic consumers would fully benefit from the increased domestic supply.

6.3 Optimal export tax for Russia

The theory behind calculating an optimal export tax for a given good was examined in chapter 3.3. At its simplest form the optimal export is simply $T^* = \left| 1/d_a \right|$, where d_a is the demand price elasticity for the country's exported product. One way to calculate is is to find the price elasticity through econometric modelling: by estimating a demand function for the product. From this function we could utilize the parameter for demand price elasticity for roundwood. Unfortunately these estimated functions do not often yield particularly realistic parameters for demand because of the vast number of possible variables that are in reality involved. At its most basic level the aggregate demand for an export from a certain country can be expressed as:

$$\log X_t^d = a_0 + a_1 \log(PX/PXW)_t + a_2 \log YW_t$$

where X^d is the quality of exports demanded, PX is the price of exports, PXW is the weighted average of the export prices of the country's trading partners, and YW is a weighed average of the real incomes of the country's trading partners. By estimating the parameters of this function, we can use a_1 as the demand elasticity for the exported product.

For coniferous roundwood, Russia's main exported roundwood, the required data on trade flows can be found from Faostat. The real purchasing power parity incomes are derived from the IMF world economic outlook database. Faostat provides time series data for export values and quantities from 1993-2007, from which we can derive unit prices for different countries. In the case of export prices from trading partners we can use the previously calculated market shares of the largest of coniferous roundwood exporters: United States, Germany, New Zealand, Canada, Sweden, Czech Republic, France, and Latvia. These shares can then be used to weigh individual countries' export unit prices to get yearly values for PXW.

For the income level purchasing power parity GDP per capita was used for the world's largest importers of coniferous roundwood: Austria, Canada, China, Finland, Germany, Japan, Korea, and Sweden. Each country's GDP per capita was weighed with the respective market share to gain yearly values for YW.

Because the Faostat data is annual, there were only 15 observations, and hence the regression can hardly be considered reliable to any degree. It does, however, provide some estimates of the demand elasticity and the relative importance of different factors for wood demand.

To further deepen the analysis, the regression takes into consideration the possibility of lagged variables affecting the relationship: mainly the possibility that it may be difficult for importers to find other trading partners despite growing Russian prices.

Augmented Dickey-Fuller tests were also run on the variables, and it was found that the variable for Russian exports was non-stationary, as was its first differential. The second differential was stationary. The same applied to the demand variable. The relationship between Russia's wood prices and world wood prices, however, was stationary in the first differential. According to the Engle-Granger method of testing co-integration Russia's exports of coniferous roundwood are also cointegrated with both the export price, and the demand variable. Because of the low number of observations, however, only three regressions were run: one for the initial demand function, one which takes into account lagged exports, and one function which calculates both their differential regression, and the long run balance. This last equation regresses the first differentials and uses a linear combination of the (lagged) variables as an error correction term. It can be presented as:

$$d\log X_t^d = a_0 + a_1 d\log(PX/PXW)_t + a_2 d\log YW_t + a_3 \log(PW/PWX)_{t-1} + a_4 \log(YW)_{t-1} + a_5 \log(X)_{t-1}$$

Regressing this equation provides us with the short run demand elasticity a_1 and by setting the differentials to zero (no change), we can also calculate the long run demand elasticity $a_3/-a_5$.

The findings are presented below:

Table 10: Correlates of Russia's coniferous roundwood exports

	lnX		dlnX
Constant	19,74	-11,07	-7,69
lnPX/PXW	2,32	0,11	
lnYW	-0,22	1,43	
lnX(t-1)		0,81 3,25*	-0,31
lnPX/PXW(t-1)			0,49
lnYW(t-1)			1,33
dlnPW/PW			-0,75
dlnYW			0,1
Observations	15	14	14
R-squared	0,72	0,8941	0,69
*statistically significant at 5 %			

While none of the regressions provide us with a statistically significant finding of the demand elasticity for coniferous roundwood, the final equation atleast provides us with a negative short term price elasticity (-0,75) and a long term price elasticity of 1,58 (0,49/0,31). This would give us a short-term optimal export tax of 133%, and the long term optimal export tax cannot be calculated, as the price elasticity of demand is supposedly still positive. Furthermore, as mentioned before, neither of these findings are statistically significant.

Another way to derive the optimal export tax is by further looking into the determinants of the demand elasticity for the country's product. The basic idea behind setting an optimal export tax was, that by utilizing its market power and the (in)elasticities of global demand and supply a country could raise its own welfare by setting an export tax. The actual formula for calculating the optimal export tax is

$$T^* = a / \left| d - s_0 (1-a) \right|$$

Where *a* is the country's share in world markets, *d* is the aggregate price elasticity of demand for the product, and s_0 is the price elasticity of supply for the rest of the world. The problem with calculating an optimal export tax for roundwood for Russia is that no calculations have really been made on the price elasticities of supply and demand in roundwood trade. While the lack of reliable global-level data hinders the precision of results presented here, we can utilize research on local supply and demand elasticities, and on the global market of other roundwood products and draw some conclusions from them.

The earliest econometric modelling on the Finnish roundwood market was performed by Jari Kuuluvainen in 1986 with his paper *An econometric analysis of the sawlog market in Finland*. The next step, applying modern time series analysis to the Finnish market, was taken by Hetemäki and Kuuluvainen, who study price elasticities in roundwood supply and demand in Finland in their 1992 paper *Incorporating Data and Theory in Roundwood Supply and Demand Estimation*. In their study they construct an econometric model of the timber market by examining private nonindustrial timber supply with a three-input demand function (capital, labor, wood). In their research they determine short and long term price elasticities based on stumpage prices for both supply and demand. Anne Toppinen took this further in 1998 with her paper *Roundwood market integration in Finland: a multivariate cointegration analysis*, where she utilized monthly data and applied more recent developments in econometric modelling.

Table 11: Supply and demand elasticity of the Finnish saw-log market in selected studies

	Short-term		**Long-term**	
Study	**Supply**	**Demand**	**Supply**	**Demand**
Kuuluvainen (1986)	3,1	-0,9		
Hetemäki & Kuuluvainen (1992)	0,81	0,14*	-0,27	-1,03
Toppinen (1998)	1,6	-1,5		

*not significant

The Finnish results can provide us with some information about the level elasticity, but the Finnish market is also hardly representative of world markets, and hence global level elasticities need to be looked at.

The Global Forest Products Model developed by the Food and Agriculture Organization of the United Nations (FAO) attempts to map trade flows, supply and demand, and input-output

relations of forest products globally. In the model the supply elasticity for industrial roundwood (sawlogs and pulpwood) is represented with an econometric equation and and the demand elasticity is represented with input-output coefficients.

The supply elasticity for industrial roundwood is a function of the price of industrial roundwood, and it is assumed to be 0,8 for all countries expect for Asia, where it varies by country. In the GFPM the demand for sawlogs and pulpwood is described by input-output coefficients (sawlogs/pulpwood input per unit of sawnwood, panels and pulp production), and the attendant manufacturing costs, so the elasticity of demand for sawlogs and pulpwood with respect to price is implicit and no set values exist.

Although the model treats sawlogs and pulpwood, as implicit, it calculates explicit world demand elasticities for a variety of other wood products.

Table 12: Price elasticity of demand for forest products (GFPM)

Product	Short-term	Long-term
Fuelwood	-0.03	-0.08
Sawnwood	-0.08	-0.23
Veneer and Plywood	-0.11	-0.16
Particle Board	-0.06	-0.10
Fibreboard	-0.10	-0.29
Other Industrial Roundwood	-0.06	-0.17
Newsprint	-0.16	-0.32
Printing and Writing Paper	-0.30	-0.70
Other Paper and Paperboard	-0.23	-0.35

Source: GFPM

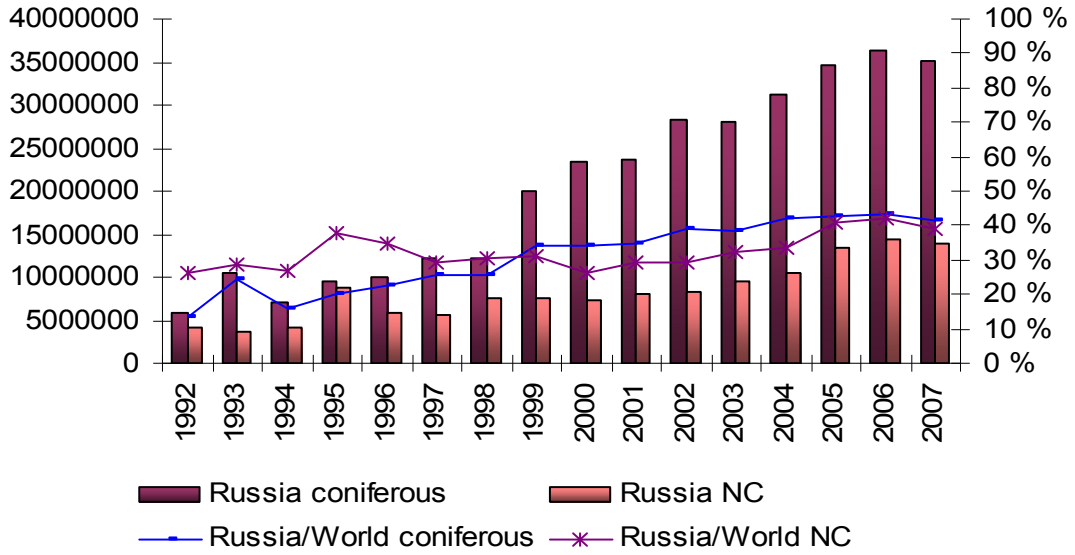
The problem then becomes: how to determine the global demand price elasticity for industrial roundwood? As no set values for this exist, and as the models made of the Finnish roundwood market are hardly representative of the whole world, it is best to calculate a few alternate scenarios, assuming that the elasticity of demand for roundwood is somewhere near the elasticity of other forest product raw materials/intermediate products, such as sawnwood, plywood, and other industrial roundwood. This would mean that in the short term the demand elasticity is very low, varying between -0,06 and -0,11, and the long term elasticity would be placed between -0,10 and -0,29.

Unfortunately no differentiation exists between the demand elasticity for coniferous and nonconiferous wood, though the global market for these two differs somewhat, and may differ

particularly strongly in Russia's case. While Russia exports coniferous wood fairly evenly to several large importers, its exports of nonconiferous wood are more concentrated, with Finland accounting for 80% of imports. This suggests monopsony power and a higher elasticity of demand for nonconiferous roundwood. In this analysis I will treat the demand elasticity for both products as equal.

Determining Russia's market share in world roundwood exports is somewhat easier, and can be done by looking at Comtrade or Faostat data. For calculating the optimal export tax I choose to use the Faostat data, as it is more conveniently arranged into a roundwood product group.

Figure 11: Russian Federation industrial roundwood exports 1992-2007 (CUM) and Russia's share of the world market

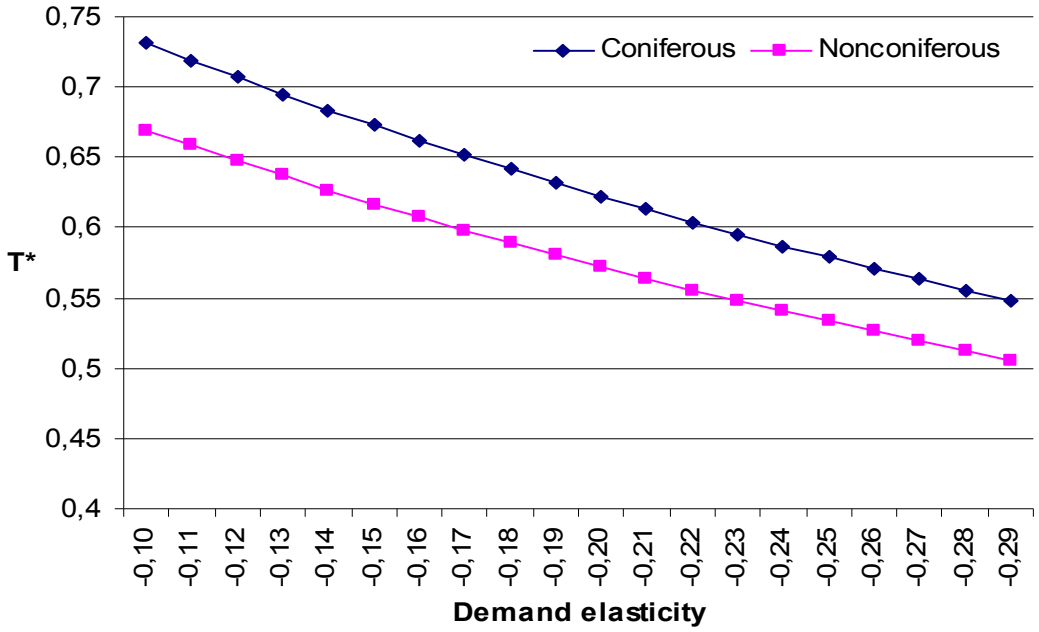


Source: FAOSTAT

As can be seen, Russia's share in world exports of industrial roundwood has increased notably since the mid 90's, particularly for coniferous roundwood. In 2006 the share in world exports was at 43% for coniferous and 42% for nonconiferous roundwood exports. With these parameters we can calculate an estimate for the theoretically optimal export tax that would maximize Russia's welfare utilizing its market power in roundwood. To reiterate: we consider Russia's share of world markets to be its 2006 share of 43% for coniferous industrial roundwood, 42% for nonconiferous industrial roundwood, the elasticity of supply for the rest of the world's roundwood production to be 0,8, and the long term price elasticity of world

demand to be between -0,10 and -0,29. By calculating for an optimal export tax with these values we get the following figure.

Figure 12: Optimal export tax for industrial roundwood with different demand price elasticities



Naturally as the price elasticity of demand increases, the optimal export tax becomes lower. Figure 9 provides us with the relative export tax based on Russia's 2006 market share. This export tax is calculated with the long term demand elasticity. Considering these numbers, it seems that the short term optimal export tax we received from calculating the demand function (133%) may not be as unreasonable as it first seems.

In 2006 the export price of coniferous industrial roundwood from Russia was 69,37 USD/CUM, and the export price of non-coniferous industrial roundwood was 50,25 USD/CUM. The implemented Russian export taxes (as seen in Table 7) are denominated both as percentages and as minimum Euro values. The first export taxes, implemented 01.07.2007, called for a 20% export tax (min 10 Euros) on spruce, pine, and over 15 cm birch (the main non-coniferous tree-export from Russia), and a 10% export tax (min 5 Euros) on aspen. The final (for now postponed) export tax increase called for an 80% export tax (min 50 euros) on spruce, pine, aspen and birch. There had been a clear upward trend in the prices of both coniferous and non-coniferous roundwood exports from Russia already for some years, but it

seems clear that the 80% tax increase is hardly welfare improving even if we were to assume extremely inelastic world demand.

6.4 Tariff jumping and the effects of export taxes on the Russian forest industry

Chapter 3,4 touched upon theories that relate trade policy to industrial structure and introduce the idea of tariff jumping. The idea that by placing restrictions on trade a country can have an effect on the movement of production factors (capital, labour) and the idea that through the same operation a country can change the industrial structure of both countries resonates strongly with the case of Russia. In principle the placement of prohibitive export taxes should move labour or capital into Russia, and in principle placing export restrictions on roundwood should motivate companies to place processing facilities in Russia instead of just exporting. The problem with this reasoning is that there is a wide array of additional costs involved in investing into Russia, and it may be that not even a prohibitive export tax would make up for those costs.

The industrial structure examination of Horstman and Markusen (1990) manipulated firm specific costs, plant specific costs, and tariff and transportation costs to find optimal Nash equilibrium outcomes of different investment scenarios. While in principle the raised tariff costs could cause a new industrial equilibrium (one where firms produce in Russia instead of importing from there), it may also be that the plant specific costs remain too high in Russia to warrant investment even with barriers to trade. This possibility is supported by Finnish companies' experiences in Russia: recently Ruukki Group lost a 40 billion Rouble greenfield investment into a pulp mill because the local administration changed. While the raised tariffs shift equilibrium towards investing into Russia, this may not happen unless other variables are simultaneously changed.

The consequences of export taxes were earlier divided into welfare effects, and distributional effects. While welfare effects deal with the terms of trade and efficiency, distributional effects have to do with income distribution among different factors of production. In addition to hurting or aiding Russia as a country, roundwood export taxes are bound to have different

kinds of effects on different sectors of the economy, and more specifically on the different subsectors of the Russian forest industry.

The main stated purpose of the roundwood export tax was to encourage industrial restructuring from products with low added value toward products with higher added value. In effect this meant moving production units (labour, capital) from logging and harvesting operations to pulp, paper, and other more advanced production sectors.

With this stated goal in mind it is obvious that the logging and harvesting sector will bear the brunt of the losses incurred by the trade policy. With the drop in export demand and crowding in domestic supply this sector will have to contract substantially. This is particularly worrying in Russia's case, since this sector is the most labour intensive in forest products. The proposed export taxes are likely to increase unemployment dramatically in areas that concentrate extensively on harvesting and logging. In addition to this, because of the high number and low concentration of harvesting and logging companies this sector was not particularly profitable in the first place.

The Russian producers that will benefit the most from the increased export taxes are those producing plywood, lumber, and to a lesser extent, pulp. The reason for this is that logs typically make up 65-75% of the variable costs of producing lumber, 65% of the variable costs for plywood, and 45-55% of the variable costs for market pulp. (CIBC 2007) Because of the increased domestic supply of roundwood these industries benefit from lower raw material costs. This may also increase their export competitiveness.

According to a UNECE/Fao Forest Products Annual Market Review, the Russian sawmilling industry has been adapting to increases in the log export tax schedule that supports more processing in Russia. A significant number of new sawmill investments were announced throughout 2007 and into the first half of 2008. (Unece/FAO, 2008)

The Russian forest sector can be called dilapidated. Average equipment is around 25 years old and the majority is depreciated by 80% (Expert, 2004). Since current Russian pulp and paper mills are already operating at or near full capacity, to increase production external investments are required. While investment into the industry is desperately required, the applied export tax on roundwood does little to deal with the fundamental problems holding

back foreign investment: underdeveloped infrastructure and an inadequate system of governance.

Because of the Russian government's recent active role in certain industries it is also possible that the government plans to take a more active role in the forest sector as well. The creation of a national champion, a paper producer with notable domestic monopoly power may well be in the government's plans

6.5 Russian export taxes from a strategic trade policy perspective

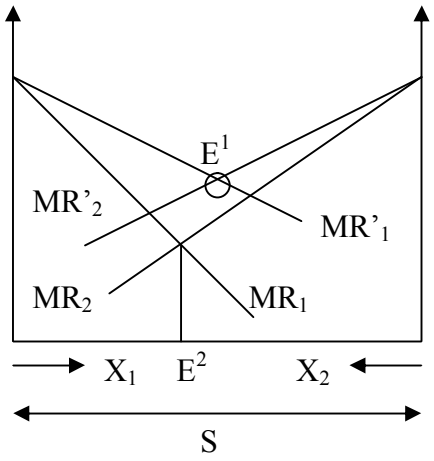
The Russian export taxes may also provide us with an interesting example on the effects imperfect competition on trade policy. The structure of the Russian forest industry has been a focusing point in this thesis, and is extremely relevant when looking at strategic trade policy. In addition to domestic industry structure, another important aspect is the structure of the global demand.

According to Helpman and Krugman's *Trade Policy and Market Structure* (1989) a government can with an export tax "monopolize" an otherwise perfectly competitive (or oligopolistic) industry. The details of this process can be found in Chapter 3.4, but the basic premise is that facing a lower profit through lower marginal revenue companies will cut down on production and hence drive up prices. In this way it would make sense for the government to tax the exports of roundwood, at least as long as it's facing perfect competition from abroad.

Whether this makes sense for roundwood production is a difficult question to answer. On one hand the industry within Russia is very fragmented, and is hence producing a surplus compared to the optimal social surplus maximizing amount. On the other hand the initial model was such that there was no domestic consumption of roundwood. This does not apply to the case at hand, since roundwood is certainly also a domestically consumed product, and the whole point of the export taxes is to ensure domestic processors their raw materials. For this reason reducing roundwood supply through an export tax seems somewhat counterintuitive.

Another matter is the taxing of roundwood from the perspective of limited resources. A particularly interesting example is where we separate the producers of pulp and paper from the producers of roundwood for exports. Roundwood exports compete for some of the same resources as pulp and paper production, the roundwood harvested by the logging companies. This reminds us of the issue presented in Figure 3, presented here for the second time.

Figure 13: Roundwood exports versus pulp and paper production



Let us consider a model of two industries and one good. That good is wood, and the two industries are the exporting of roundwood (X_1), and the production of pulp and paper (X_2). Both industries compete for a single, limited resource: felled wood. I have modelled here roundwood exporting to be a more perfectly competitive industry, with perceived marginal revenue (MR' far above true marginal revenue and hence close to world demand), and the pulp and paper industry to be a more concentrated industry, with perceived marginal revenue to be lower, closer to true marginal revenue. In this case in principle both industries might be eligible for export tariffs, since both are currently producing more than they should, but were both to maximize profits based on true marginal revenue instead of perceived marginal revenue, resource distribution should move from E^1 to E^2, meaning the roundwood exporting industry should utilize less of the wood resources, and the pulp and paper industry more.

This example is somewhat questionable, since the foreign demand elasticity differs strongly for different wood products. While the pulp and paper industry is probably more concentrated than roundwood exporting in Russia, it's quite possible that worldwide Russia can collect relatively more producer surplus from roundwood exports where it has more market power.

7. Conclusions

Russia's forest industry has had an influence on its Finnish counterpart ever since one became separate from the other. The vast forest resources, close knit trade relations, and varying economic and political systems of our neighbour have had a profound impact on the development of the Finnish forest industry as well. As a trade partner and a competitor, the Russian forest industry has become a source of raw materials, but also a destination for investments. Hence its development is important to Finland.

Both competitiveness and trade policy are widely researched subjects with established methods and a theory base to build on. This makes it possible to study the Russian forest industry and the trade policy implications of an export tax together to form a more complete picture of the effects of the export tax. Historically export taxes have not been a very successful policy instrument, but Russia's case has several factors which make it a unique proponent of the trade policy.

Compared to its Finnish counterpart, the Russian forest industry is inefficient and focused on products with a low added value. Compared to other countries in similar stages of economic development, Russia is pretty much on par. In terms of resources the country has enormous potential in the field of forest products, but insufficient infrastructure, troublesome legislation, and a lack of capital investments are holding back development. Capacity in pulp and paper mills is mostly utilized, so in the short term increased supply of roundwood is unlikely to boost production.

As a large country Russia would probably benefit from the terms of trade effect of a correctly priced roundwood export tax. As its current tax policy aims to be prohibitive to roundwood trade, this terms of trade effect is not quite as relevant as the income distribution effect and the structural transformation the tax will likely cause. The structural transformation may be achieved by raising barriers to trade and hence encouraging factor movements, but it may be that this is not sufficient to make investing into wood processing in Russia profitable. The main beneficiaries from the export tax are those domestic industries where roundwood prices account for notable share of the final cost. Those industries are plywood, lumber, and pulp. The main sufferer is the logging and harvesting industry, which is already rather unprofitable.

Perhaps the most important variable in determining the industry effects of the trade policy is the industry concentration and structure, both in Russia and abroad. Russia has significant market power as an exporter of roundwood, a benefit it would lose were it to move to more sophisticated products. On the other hand importers of Russian forest products would also lose some of their monopsony power.

The export tax Russia is imposing is unlikely to have the intended effects. The original idea was to force foreign investors to invest in production within the country, instead of transporting raw materials out. The export tax does not change any of the factors that have made the situation as it is in the first place. Transporting roundwood long distances is a relatively unprofitable enterprise due to the low value/weight ratio of the product. It is in the interests of forest producers to have further processing as near as possible to the raw material base. This means that there are heavy reasons outside of foreign protectionism why forest industry investors are not investing in Russia. Erratic industrial policy, which includes raised tariffs, occasional industrial nationalization, and a rift between territorial and federal politics, is unlikely to improve the situation.

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Appendices

Appendix 1: Product level PRODY, prody, and Russia's RCA values

Number	Commodity	PRODY	prody	RCA (Russia)
440110	Fuel wood, in logs, in billets... o	11504,96	10,63	0,74
440121	Coniferous wood in chips or particl	20381,93	10,61	2,09
440122	Non-coniferous wood in chips or par	13288,85	10,53	0,08
440130	Sawdust, wood waste and scrap (incl	18809,26	10,52	0,99
440200	Wood charcoal	5179,33	10,40	0,17
440310	Wood in the rough..., treated with	8663,28	10,35	0,37
440320	Untreated coniferous wood in the ro	16171,09	10,31	14,67
440331	Dark Red Meranti, Light Red Meranti	8042,01	10,29	0,00
440333	Keruing, Ramin, Kapur, Teak, Jongko	9036,15	10,27	0,00
440391	Oak (Quercus spp.) wood in the roug	16266,42	10,26	6,01
440392	Beech (Fagus spp.) wood in the roug	14443,63	10,19	0,22
440399	Wood, nes in the rough..., (excl. t	9769,98	10,16	9,83
440410	Coniferous hoopwood; split poles, e	9683,35	10,14	0,29
440420	Non-coniferous hoopwood; split pole	5768,30	10,13	0,01
440500	Wood wool; wood flour	2039,26	10,13	0,89
440610	Railway or tramway sleepers (cross-	9878,91	10,09	5,05
440690	Railway or tramway sleepers (cross-	7247,74	10,07	4,20
440710	Coniferous wood sawn or chipped len	15936,55	10,04	3,25
440721	Specified tropical woods (Meranti,	11489,83	10,03	0,00
440722	Specified tropical woods (OKoume...	6361,09	10,03	0,00
440723	Baboen, Mahogany, Imbuia and Balsa	5514,46	10,01	0,00
440791	Oak (Quercus spp.) wood,sawn/chippe	14049,96	10,00	0,47
440792	Beech (Fagus spp.) wood,sawn/chippe	7746,94	9,99	0,23
440799	Wood, nes sawn or chipped lengthwis	7051,79	9,99	0,37
440810	Coniferous veneer sheets and sheets	11799,60	9,97	0,04
440820	Specified tropical wood veneer shee	6488,71	9,97	0,00
440890	Veneer sheets and sheets for plywoo	11241,10	9,96	0,20
440910	Coniferous wood, continuously shape	17552,74	9,95	0,35
440920	Non-coniferous wood, continuously s	17391,13	9,93	0,12
441010	Particle board and similar board of	20791,62	9,92	0,30
441090	Particle board and similar board of	29852,44	9,91	0,00
441111	Fibreboard of a density >0.8g/cm3,	11570,69	9,89	3,28
441119	Fibreboard of a density >0.8g/cm3,	28734,39	9,89	0,27
441121	Fibreboard of a density >0.5g/cm3 b	17796,76	9,88	0,03
441129	Fibreboard of a density >0.5g/cm3 b	20454,32	9,88	0,12
441131	Fibreboard of a density >0.35g/cm3	17386,49	9,87	0,00
441139	Fibreboard of a density >0.35g/cm3	55237,72	9,87	0,01
441191	Fibreboard of a density =<0.35g/cm3	21466,06	9,86	0,03
441199	Fibreboard of a density =<0.35g/cm3	16911,12	9,84	0,02
441211	Plywood with >=1 outer ply of tropi	8949,26	9,82	0,00
441212	Plywood with >=1 outer ply of non-c	13110,37	9,79	4,98
441219	Plywood, each ply =<6mm thick, nes	6331,08	9,78	0,47
441221	Plywood... >6mm non-coniferous oute	8375,58	9,77	0,01
441229	Plywood... >6mm non-coniferous oute	11994,64	9,76	0,01

441291	Plywood... containing at least one	4738,85	9,76	0,02
441299	Plywood, veneered panels and simila	8182,00	9,75	0,01
441300	Densified wood, in blocks, plates,	7185,73	9,75	0,02
441400	Wooden frames for paintings, photog	10264,59	9,74	0,00
441510	Cases, boxes, crates, drums and sim	18410,64	9,74	0,06
441520	Pallets, box pallets and other load	15498,07	9,74	0,11
441600	Casks, barrets, vats, tubs, etc, an	21857,73	9,73	0,09
441700	Tools..., broom or brush bodies...	9389,22	9,72	0,11
441810	Windows, French-windows and their f	18500,80	9,71	0,08
441820	Doors and their frames and threshol	11297,89	9,70	0,37
441830	Parquet panels, of wood	21620,38	9,70	0,04
441840	Shuttering for concrete constructio	10673,60	9,67	0,03
441850	Shingles and shakes, of wood	10637,66	9,66	0,13
441890	Builders' joinery and carpentry, of	13179,82	9,65	0,29
441900	Tableware and kitchenware, of wood	4733,78	9,65	0,21
442010	Statuettes and other ornaments, of	3778,27	9,65	1,53
442090	Wood marquetry, inlaid wood; casket	11595,90	9,64	0,02
442110	Clothes hangers of wood	12998,75	9,64	0,00
442190	Articles of wood, nes	12320,61	9,64	0,36
450110	Natural cork, raw or simply prepare	15898,54	9,61	0,00
450190	Waste cork; crushed, granulated or	8617,24	9,60	0,00
450200	Natural cork, debacked or roughly s	18757,07	9,60	0,00
450310	Corks and stoppers of natural cork	10628,79	9,60	0,01
450390	Articles of natural cork, nes	6858,44	9,60	0,00
450410	Blocks..., tiles of any shape, soli	12346,32	9,60	0,00
450490	Agglomerated cork; articles of aggl	13840,09	9,59	0,00
470100	Mechanical wood pulp	32067,55	9,59	0,00
470200	Chemical wood pulp, dissolving grad	21746,51	9,58	1,96
470311	Unbleached coniferous chemical wood	17814,16	9,56	8,29
470319	Unbleached non-coniferous chemical	21076,25	9,55	0,00
470321	Semi-bleached or bleached coniferou	24903,62	9,55	0,98
470329	Semi- or bleached non-coniferous ch	12431,79	9,54	1,04
470411	Unbleached coniferous chemical wood	23696,64	9,54	13,29
470419	Unbleached non-coniferous chemical	24655,75	9,52	0,00
470421	Semi-bleached or bleached coniferou	27678,09	9,52	2,32
470429	Semi- or bleached non-coniferous ch	24864,94	9,51	0,00
470500	Semi-chemical wood pulp	31788,73	9,51	0,00
470610	Cotton linters pulp	20895,12	9,50	0,20
470691	Mechanical pulp of fibrous cellulos	23815,82	9,50	0,00
470692	Chemical pulp of fibrous cellulosic	6724,95	9,50	0,00
470693	Semi-chemical pulp of fibrous cellu	11955,53	9,47	0,01
470710	Waste and scrap of unbleached kraft	19658,74	9,45	0,11
470720	Waste and scrap of other paper or p	15713,66	9,44	0,02
470730	Waste and scrap of paper or paperbo	21429,67	9,43	0,16
470790	Waste and scrap of paper or paperbo	17795,18	9,43	0,07
480100	Newsprint, in rolls or sheets	22828,34	9,41	2,21
480210	Hand-made paper and paperboard	58385,32	9,41	0,00
480220	Paper and paperboard as a base for	23246,65	9,40	0,00
480230	Carbonizing base paper, uncoated, i	19380,60	9,38	0,02
480240	Wallpaper base, uncoated, in rolls	25215,05	9,37	2,84
480251	Paper... (excl. mechanical fibres),	13072,58	9,37	0,37
480252	Paper... (excl. mechanical fibres),	17442,77	9,36	0,66

480253	Paper... (excl. mechanical fibres),	37102,59	9,34	0,08
480260	Paper... (>10% of mechanical fibres	38221,18	9,34	0,03
480300	Toilet... similar paper, in rolls o	18139,56	9,33	0,02
480411	Unbleached kraftliner, uncoated, in	18811,19	9,33	1,21
480419	Kraftliner, uncoated (excl. unbleac	17582,96	9,32	0,87
480421	Unbleached sack kraft paper, uncoat	10838,50	9,31	3,62
480429	Sack kraft paper (excl. unbleached)	20423,37	9,31	0,00
480431	Unbleached kraft paper..., weighing	26658,24	9,31	0,32
480439	Kraft paper... (excl. unbleached),	27444,28	9,29	0,01
480441	Unbleached kraft paper..., weighing	19727,37	9,28	0,00
480442	Kraft paper..., weighing >150g/m2 b	26318,39	9,27	0,00
480449	Kraft paper..., weighing >150g/m2 b	17048,13	9,27	0,00
480451	Unbleached kraft paper..., weighing	18139,07	9,27	0,05
480452	Kraft paper..., weighing >=225g/m2,	33004,48	9,27	0,00
480459	Kraft paper..., weighing >=225g/m2,	10279,15	9,25	0,03
480510	Semi-chemical fluting paper (corrug	16365,45	9,25	0,02
480521	Multi-ply paper and paperboard with	3890,30	9,25	0,00
480522	Multi-ply paper... with only one ou	6247,71	9,24	0,00
480523	Multi-ply paper... two outer layers	5093,60	9,24	0,00
480529	Multi-ply paper and paperboard, in	14085,71	9,23	0,20
480530	Sulphite wrapping paper, in rolls o	13157,89	9,21	0,21
480540	Filter paper and paperboard, in rol	22821,27	9,20	0,02
480550	Felt paper and paperboard, in rolls	13662,03	9,20	0,11
480560	Paper and paperboard, in rolls or s	14185,72	9,20	0,65
480570	Paper..., in rolls or sheets, weigh	18641,43	9,19	0,85
480580	Paper and paperboard, in rolls or s	25121,91	9,18	0,13
480610	Vegetable parchment, in rolls or sh	20304,74	9,17	2,65
480620	Greaseproof papers, in rolls or she	29546,40	9,17	0,57
480630	Tracing papers, in rolls or sheets	27504,41	9,16	0,26
480640	Glassine and other glazed transpare	28707,62	9,15	0,12
480710	Composite paper..., laminated with	4536,15	9,11	0,00
480791	Straw paper and paperboard, in roll	5093,60	9,11	0,00
480799	Composite paper and paperboard, in	22563,43	9,09	0,08
480810	Corrugated paper and paperboard, in	10583,26	9,09	0,11
480820	Sack kraft paper, creped or crinkle	13243,34	9,06	0,00
480830	Kraft paper, creped or crinkled, (e	44583,60	9,05	0,00
480890	Paper and paperboard, corrugated, c	11715,47	9,05	0,01
480910	Carbon or similar copying papers, i	19303,00	9,05	0,00
480920	Self-copy paper, in rolls or sheets	21684,19	9,05	0,00
480990	Copying or transfer papers, nes, in	19701,64	9,05	0,00
481011	Paper..., coated with kaolin, etc,	26537,66	9,05	0,00
481012	Paper..., coated with kaolin, etc,	5105,97	9,04	0,00
481021	Light-weight coated paper for writi	32794,27	9,03	0,00
481029	Paper... for writing, etc, >10% mec	28259,61	9,03	0,00
481031	Kraft paper..., bleached, >95% chem	35124,72	9,02	0,00
481032	Kraft paper..., bleached, >95% chem	29859,17	9,01	0,00
481039	Kraft paper and paperboard, coated.	29061,36	9,01	0,00
481091	Multi-ply paper and paperboard, coa	25909,90	9,01	0,11
481099	Paper and paperboard, coated with k	15917,46	9,01	0,01
481110	Tarred, bituminized or asphalted pa	20989,55	8,99	0,06
481121	Self-adhesive paper and paperboard	51611,31	8,99	0,00
481129	Gummed paper and paperboard (excl.	12968,56	8,98	0,02

481131	Paper..., coated... with plastics,	34246,53	8,98	0,07
481139	Paper and paperboard coated... with	20133,20	8,98	0,17
481140	Paper and paperboard coated... with	22360,97	8,96	0,15
481190	Paper, paperboard, coated... surfac	26341,54	8,94	0,02
481200	Filter blocks, slabs and plates, of	22536,59	8,92	0,02
481310	Cigarette paper in the form of book	24662,37	8,91	0,00
481320	Cigarette paper in rolls of a width	12277,97	8,90	0,03
481390	Cigarette paper, nes	12848,98	8,90	0,07
481410	Ingrain paper	13015,36	8,87	0,26
481420	Wallpaper, etc, of paper coated wit	11872,86	8,87	0,43
481430	Wallpaper, etc, consisting of paper	29177,66	8,86	0,00
481490	Wallpaper and other wall coverings;	12515,95	8,84	0,32
481500	Floor coverings on a base of paper	6872,02	8,83	0,00
481610	Carbon or similar copying papers	12409,80	8,83	0,01
481620	Self-copy paper	24834,16	8,82	0,00
481630	Duplicator stencils of paper	10759,15	8,82	0,00
481690	Copying or transfer paper, nes; off	24073,50	8,82	0,00
481710	Envelopes of paper or paperboard	20967,26	8,81	0,01
481720	Letter cards, plain postcards and c	17142,16	8,81	0,00
481730	Boxes, etc, of paper or paperboard	28700,25	8,80	0,03
481810	Toilet paper	10421,66	8,78	0,08
481820	Handkerchiefs and cleansing or faci	22641,24	8,76	0,01
481830	Tablecloths and serviettes of paper	12020,25	8,76	0,05
481840	Sanitary towels and tampons, napkin	14723,77	8,75	0,05
481850	Articles of apparel and clothing of	13126,03	8,74	0,01
481890	Household, sanitary or hospital art	20867,82	8,73	0,05
481910	Cartons, boxes and cases, of corrug	12761,60	8,72	0,04
481920	Folding cartons, boxes and cases, o	12084,29	8,69	0,08
481940	Sacks and bags, including cones of	12446,99	8,69	0,01
481950	Packing containers, including recor	20098,44	8,65	0,02
481960	Box files, letter trays, storage bo	17645,64	8,65	0,00
482010	Registers, account books, order and	6225,78	8,61	0,05
482020	Exercise-books	4960,30	8,60	0,93
482030	Binders (other than book covers), f	14517,06	8,58	0,06
482040	Manifold business forms and interle	15045,85	8,57	0,04
482050	Albums for stamps or for collection	12812,46	8,56	0,01
482090	Blotting pads, book covers and othe	10534,53	8,54	0,12
482110	Printed paper or paperboard labels	17430,73	8,54	0,06
482190	Paper or paperboard labels of all k	17699,15	8,54	0,00
482210	Bobbins, spools..., of paper or pap	21970,35	8,51	0,04
482290	Bobbins, spools, cops and similar s	30715,97	8,51	0,06
482311	Self-adhesive paper, in strips or r	21250,56	8,51	0,01
482319	Gummed or adhesive paper (excl. sel	23526,64	8,50	0,00
482320	Filter paper and paperboard, cut to	20742,96	8,47	0,06
482340	Rolls, sheets and dials, printed fo	21799,13	8,46	0,15
482351	Printed, embossed or perforated pap	6204,72	8,43	0,00
482359	Paper and paperboard writing, print	5120,78	8,38	0,00
482360	Trays, dishes, plates and cups, etc	14532,92	8,34	0,07
482370	Moulded or pressed articles of pape	16787,54	8,32	0,05
482390	Paper and paperboard, cut to size a	14331,65	8,32	0,08
490110	Printed books, brochures, leaflets,	15084,93	8,31	0,14
490191	Dictionaries and encyclopaedias, an	23812,42	8,26	0,58

490199	Printed books, brochures, leaflets	20147,09	8,25	0,47
490210	Newspapers, journals and periodical	14564,06	8,20	0,04
490290	Newspapers, journals and periodical	23063,24	8,18	0,54
490300	Children's picture, drawing or colo	24360,13	8,17	0,04
490400	Music, printed or in manuscript	9869,97	8,12	0,00
490591	Maps and hydrographic or similar ch	12864,70	8,09	0,10
490599	Maps and hydrographic or similar ch	13098,98	8,06	0,25
490600	Plans... for architectural... purpo	14762,64	8,03	0,38
490700	New stamps; stamp-impressed paper;	9837,84	8,03	0,17
490810	Transfers (decalcomanias), vitrifia	27825,32	8,01	0,00
490890	Transfers (decalcomanias) (excl. vi	28034,61	8,00	0,01
490900	Printed or illustrated postcards; p	11005,21	7,93	0,10
491000	Calendars of any kind, printed, inc	15122,23	7,88	1,39
491110	Trade advertising material, commerc	21417,77	7,65	0,01
491191	Pictures, designs and photographs	9821,40	7,41	0,52
491199	Other printed matter, nes	12165,53	7,23	0,31

Appendix 2: Countries EXPY and expy values

	Country	EXPY		Country	expy
1	Luxembourg	35281,38	1	Luxembourg	21367,22
2	Qatar	31195,68	2	Finland	16859,72
3	Norway	24859,95	3	Qatar	16334,92
4	Finland	24117,33	4	Norway	15921,6
5	Korea	22380,59	5	Korea	15711,99
6	Brunei	22339,15	6	Sweden	14626,4
7	Japan	21773,86	7	Japan	14457,03
8	Sweden	21485,67	8	Bahrain	13738,81
9	Switzerland	20921,74	9	Switzerland	13642,08
10	France	20798,73	10	Canada	13484,41
11	Canada	20379,95	11	France	13306,56
12	Germany	20379,05	12	Belgium	13228,11
13	Belgium	20373,69	13	Germany	13222,3
14	Bahrain	19832,6	14	Netherlands	12658,63
15	Netherlands	19746,86	15	Austria	12568,3
16	United Kingdom	19721,48	16	Ireland	12531,41
17	Austria	19691,9	17	United Kingdom	12182,73
18	Ireland	19636,84	18	Chile	12173,38
19	Italy	19477,23	19	Spain	12140,64
20	Spain	19143,76	20	Italy	12105,17
21	United States	19070,12	21	Argentina	11933,37
22	India	18568,25	22	Slovenia	11867,11
23	Slovenia	18560,42	23	Brunei	11759,78
24	Taiwan	18512,93	24	United States	11728,57
25	Chile	18289,87	25	Cyprus	11700,56
26	New Zealand	18155,27	26	New Zealand	11497,67
27	Argentina	18078	27	Venezuela	11483,96
28	Cyprus	17877	28	Hungary	11464
29	Oman	17846,51	29	South Africa	11446,31
30	South Africa	17836	30	Czech Republic	11337,26
31	Czech Republic	17784,71	31	Taiwan	11291,54

32	Colombia	17714,5	32	Oman	11212,62
33	Hong Kong	17604,58	33	Denmark	11140,57
34	Israel	17543,33	34	Slovak Republic	11120,05
35	Denmark	17482,24	35	Poland	10986,38
36	Singapore	17388,02	36	Israel	10922,11
37	Greece	17333,18	37	Barbados	10570,14
38	Hungary	17298,59	38	Colombia	10543,06
39	Mauritius	17088,85	39	Greece	10496,26
40	Poland	17070,54	40	Turkey	10366,78
41	Barbados	16631,11	41	Mauritius	10331,37
42	Slovak Republic	16585,39	42	Ukraine	10319,52
43	Australia	16514,49	43	Australia	10309,06
44	Mexico	16361,67	44	Hong Kong	10284,76
45	**Russia**	16295,61	45	Mexico	10120,12
46	Costa Rica	16150,27	46	Costa Rica	10102,59
47	Iceland	16082,13	47	**Russia**	9974,866
48	Venezuela	16057,87	48	Botswana	9822,465
49	Turkey	16038,96	49	Portugal	9804,444
50	Iran	15734,89	50	Egypt	9785,177
51	El Salvador	15666,9	51	Singapore	9783,059
52	Estonia	15613,23	52	Iceland	9758,595
53	Ukraine	15560,74	53	India	9748,749
54	Thailand	15553,86	54	Belarus	9649,398
55	Lithuania	15520,25	55	Kazakhstan	9646,358
56	Egypt	15456,26	56	Lithuania	9631,879
57	Guatemala	15346,72	57	Estonia	9625,252
58	Croatia	15121,84	58	Iran	9569,189
59	Pakistan	15068,41	59	Saudi Arabia	9521,063
60	Jordan	14975,26	60	Thailand	9502,681
61	Trinidad and Tobago	14901,49	61	Latvia	9438,624
62	Latvia	14873,55	62	El Salvador	9405,976
63	Saudi Arabia	14852,22	63	Trinidad and Tobago	9395,963
64	Moldova	14825,56	64	Croatia	9350,608
65	Belarus	14798,28	65	Jordan	9311,616
66	Bahamas, The	14771,84	66	Guatemala	9282,32
67	Indonesia	14750,69	67	Romania	9259,171
68	Romania	14620,9	68	Tunisia	9175,367
69	Panama	14608,3	69	Panama	9095,422
70	China	14584,94	70	Armenia	9043,245
71	Portugal	14569,59	71	Jamaica	9013,36
72	Bulgaria	14393,64	72	Dominica	9000,134
73	Tunisia	14365,75	73	Indonesia	8944,04
74	Jamaica	14329,23	74	Pakistan	8774,55
75	Yemen	14326,89	75	Moldova	8747,379
76	Botswana	14265,03	76	Bulgaria	8678,388
77	Armenia	14154,65	77	Cape Verde	8581,709
78	Senegal	14077,52	78	Brazil	8564,596
79	Brazil	13997,86	79	St. Lucia	8435,741
80	Zambia	13879,98	80	Bosnia and Herzegovina	8396,358
81	Kazakhstan	13818,09	81	Grenada	8383,289
82	Uruguay	13749,01	82	Seychelles	8320,99
83	St. Lucia	13496,18	83	Algeria	8155,92

84	Rwanda	13477,47	84	China	8119,719
85	Seychelles	13451,48	85	Albania	8018,037
86	Syrian Arab Republic	13402,44	86	St. Vincent and the Gren.	8012,07
87	Cape Verde	13354,24	87	Morocco	8004,121
88	Honduras	13345,84	88	Malaysia	7983,577
89	Vietnam	13330,61	89	Uruguay	7937,736
90	Bosnia and Herzegovina	13289,23	90	Philippines	7924,802
91	Philippines	13273,2	91	Bahamas, The	7852,352
92	Niger	13236,91	92	Senegal	7829,287
93	Kenya	13162,1	93	Honduras	7669,274
94	St. Vincent and the Gren.	12841,44	94	Vietnam	7656,281
95	Paraguay	12734,26	95	Georgia	7648,751
96	Malaysia	12716,61	96	Azerbaijan	7492,909
97	Dominica	12441,45	97	Syrian Arab Republic	7260,752
98	Peru	12386,96	98	Fiji	7249,634
99	Albania	12248,44	99	Zambia	7207,683
100	Nicaragua	12192,08	100	Ecuador	7061,884
101	Kyrgyz Republic	12091,13	101	Nicaragua	7009,41
102	Fiji	11885,88	102	Belize	7006,438
103	Morocco	11800,92	103	Peru	6882,272
104	St. Kitts and Nevis	11762,3	104	Kyrgyz Republic	6753,532
105	Georgia	11705,9	105	Paraguay	6725,222
106	Tanzania	11611,51	106	Kenya	6425,371
107	Mali	11522,88	107	Bolivia	6419,966
108	Azerbaijan	11427,88	108	Yemen	6338,666
109	Malta	11340,04	109	Sudan	5945,445
110	Algeria	11221,24	110	St. Kitts and Nevis	5942,517
111	Ecuador	11053,4	111	Rwanda	5897,564
112	Grenada	10805,49	112	Tanzania	5890,948
113	Madagascar	10729,89	113	Gabon	5770,08
114	Sudan	10697,08	114	Madagascar	5580,727
115	Bolivia	10506,86	115	Niger	5456,364
116	Mozambique	10152,58	116	Mozambique	5443,43
117	Belize	9896,694	117	Malta	5179,667
118	Namibia	9829,207	118	Mali	5174,053
119	Malawi	9605,341	119	Namibia	4785,479
120	Gabon	9108,562	120	Mongolia	4721,168
121	Uganda	8890,616	121	Cameroon	4444,676
122	Burundi	8782,701	122	Malawi	4443,332
123	Mongolia	8423,455	123	Guyana	4160,016
124	Guyana	7931,663	124	Ghana	4101,758
125	Cameroon	7741,223	125	Uganda	4095,914
126	Ghana	7695,794	126	Gambia, The	3145,891
127	Gambia, The	6957,633	127	Burundi	2765,331
128	Maldives	3778,273	128	Maldives	2633,801

Appendix 3: Export market shares

Country	Ind.RW	Ind.RW (Con)	Ind.RW (NC)	Paper & Paperboard	Sawnwood	Wood Pulp
Afghanistan	0,00	0,00	0,00	0,00	0,00	0,00
Albania	0,00	0,00	0,00	0,00	0,00	0,00
Algeria	0,00	0,00	0,00	0,00	0,00	0,00
American Samoa	0,00	0,00	0,00	0,00	0,00	0,00
Andorra	0,00	0,00	0,00	0,00	0,00	0,00
Angola	0,00	0,00	0,00	0,00	0,00	0,00
Antigua and Barbuda	0,00	0,00	0,00	0,00	0,00	0,00
Argentina	0,00	0,00	0,00	0,00	0,00	0,00
Armenia	0,00	0,00	0,00	0,00	0,00	0,00
Aruba	0,00	0,00	0,00	0,00	0,00	0,00
Australia	0,01	0,01	0,00	0,01	0,00	0,00
Austria	0,01	0,01	0,00	0,04	0,05	0,00
Azerbaijan	0,00	0,00	0,00	0,00	0,00	0,00
Bahamas	0,00	0,00	0,00	0,00	0,00	0,00
Bahrain	0,00	0,00	0,00	0,00	0,00	0,00
Bangladesh	0,00	0,00	0,00	0,00	0,00	0,00
Barbados	0,00	0,00	0,00	0,00	0,00	0,00
Belarus	0,01	0,01	0,01	0,00	0,01	0,00
Belgium	0,01	0,01	0,01	0,03	0,01	0,02
Belize	0,00	0,00	0,00	0,00	0,00	0,00
Benin	0,00	0,00	0,00	0,00	0,00	0,00
Bhutan	0,00	0,00	0,00	0,00	0,00	0,00
Bolivia	0,00	0,00	0,00	0,00	0,00	0,00
Bosnia and Herzegov.	0,00	0,00	0,00	0,00	0,01	0,00
Brazil	0,00	0,00	0,00	0,02	0,02	0,14
British Indian Ocean	0,00	0,00	0,00	0,00	0,00	0,00
British Virgin Islands	0,00	0,00	0,00	0,00	0,00	0,00
Brunei Darussalam	0,00	0,00	0,00	0,00	0,00	0,00
Bulgaria	0,00	0,00	0,01	0,00	0,00	0,00
Burkina Faso	0,00	0,00	0,00	0,00	0,00	0,00
Burundi	0,00	0,00	0,00	0,00	0,00	0,00
Cambodia	0,00	0,00	0,00	0,00	0,00	0,00
Cameroon	0,00	0,00	0,00	0,00	0,00	0,00
Canada	0,04	0,05	0,01	0,12	0,28	0,24
Cape Verde	0,00	0,00	0,00	0,00	0,00	0,00
Cayman Islands	0,00	0,00	0,00	0,00	0,00	0,00
Central African Rep.	0,00	0,00	0,00	0,00	0,00	0,00
Chad	0,00	0,00	0,00	0,00	0,00	0,00
Chile	0,00	0,00	0,00	0,00	0,02	0,06
China	0,01	0,00	0,01	0,05	0,01	0,00
Christmas Island	0,00	0,00	0,00	0,00	0,00	0,00
Cocos (Keeling) Islands	0,00	0,00	0,00	0,00	0,00	0,00
Colombia	0,00	0,00	0,00	0,00	0,00	0,00
Comoros	0,00	0,00	0,00	0,00	0,00	0,00
Congo	0,00	0,00	0,01	0,00	0,00	0,00
Congo, Dem. Rep.	0,00	0,00	0,00	0,00	0,00	0,00
Cook Islands	0,00	0,00	0,00	0,00	0,00	0,00
Costa Rica	0,00	0,00	0,00	0,00	0,00	0,00

Côte d'Ivoire	0,00	0,00	0,00	0,00	0,00	0,00
Croatia	0,00	0,00	0,01	0,00	0,00	0,00
Cuba	0,00	0,00	0,00	0,00	0,00	0,00
Cyprus	0,00	0,00	0,00	0,00	0,00	0,00
Czech Republic	0,02	0,03	0,01	0,01	0,01	0,01
Denmark	0,00	0,01	0,00	0,00	0,00	0,00
Djibouti	0,00	0,00	0,00	0,00	0,00	0,00
Dominica	0,00	0,00	0,00	0,00	0,00	0,00
Dominican Republic	0,00	0,00	0,00	0,00	0,00	0,00
Ecuador	0,00	0,00	0,00	0,00	0,00	0,00
Egypt	0,00	0,00	0,00	0,00	0,00	0,00
El Salvador	0,00	0,00	0,00	0,00	0,00	0,00
Equatorial Guinea	0,01	0,00	0,01	0,00	0,00	0,00
Eritrea	0,00	0,00	0,00	0,00	0,00	0,00
Estonia	0,01	0,01	0,02	0,00	0,01	0,00
Ethiopia	0,00	0,00	0,00	0,00	0,00	0,00
Falkland Islands	0,00	0,00	0,00	0,00	0,00	0,00
Faroe Islands	0,00	0,00	0,00	0,00	0,00	0,00
Fiji	0,00	0,00	0,00	0,00	0,00	0,00
Finland	0,01	0,01	0,00	0,11	0,06	0,06
France	0,03	0,02	0,03	0,05	0,01	0,01
French Guiana	0,00	0,00	0,00	0,00	0,00	0,00
French Polynesia	0,00	0,00	0,00	0,00	0,00	0,00
Gabon	0,01	0,00	0,04	0,00	0,00	0,00
Gambia	0,00	0,00	0,00	0,00	0,00	0,00
Georgia	0,00	0,00	0,00	0,00	0,00	0,00
Germany	0,06	0,07	0,04	0,09	0,07	0,02
Ghana	0,00	0,00	0,00	0,00	0,00	0,00
Gibraltar	0,00	0,00	0,00	0,00	0,00	0,00
Greece	0,02	0,03	0,00	0,00	0,00	0,00
Greenland	0,00	0,00	0,00	0,00	0,00	0,00
Grenada	0,00	0,00	0,00	0,00	0,00	0,00
Guadeloupe	0,00	0,00	0,00	0,00	0,00	0,00
Guatemala	0,00	0,00	0,00	0,00	0,00	0,00
Guinea	0,00	0,00	0,00	0,00	0,00	0,00
Guinea-Bissau	0,00	0,00	0,00	0,00	0,00	0,00
Guyana	0,00	0,00	0,00	0,00	0,00	0,00
Haiti	0,00	0,00	0,00	0,00	0,00	0,00
Honduras	0,00	0,00	0,00	0,00	0,00	0,00
Hungary	0,01	0,00	0,02	0,00	0,00	0,00
Iceland	0,00	0,00	0,00	0,00	0,00	0,00
India	0,00	0,00	0,00	0,00	0,00	0,00
Indonesia	0,01	0,00	0,01	0,03	0,01	0,06
Iran, Islamic Rep.	0,00	0,00	0,00	0,00	0,00	0,00
Iraq	0,00	0,00	0,00	0,00	0,00	0,00
Ireland	0,00	0,00	0,00	0,00	0,00	0,00
Israel	0,00	0,00	0,00	0,00	0,00	0,00
Italy	0,00	0,00	0,00	0,03	0,00	0,00
Jamaica	0,00	0,00	0,00	0,00	0,00	0,00
Japan	0,00	0,00	0,00	0,01	0,00	0,00
Jordan	0,00	0,00	0,00	0,00	0,00	0,00
Kazakhstan	0,00	0,00	0,00	0,00	0,00	0,00

Kenya	0,00	0,00	0,00	0,00	0,00	0,00
Korea DPR	0,00	0,00	0,00	0,00	0,00	0,00
Korea, Rep.	0,00	0,00	0,00	0,03	0,00	0,00
Kuwait	0,00	0,00	0,00	0,00	0,00	0,00
Kyrgyzstan	0,00	0,00	0,00	0,00	0,00	0,00
Lao DPR	0,00	0,00	0,00	0,00	0,00	0,00
Latvia	0,03	0,02	0,04	0,00	0,02	0,00
Lebanon	0,00	0,00	0,00	0,00	0,00	0,00
Liberia	0,00	0,00	0,00	0,00	0,00	0,00
Libyan Arab Jamahiriya	0,00	0,00	0,00	0,00	0,00	0,00
Liechtenstein	0,00	0,00	0,00	0,00	0,00	0,00
Lithuania	0,01	0,01	0,01	0,00	0,01	0,00
Luxembourg	0,00	0,00	0,00	0,00	0,00	0,00
Madagascar	0,00	0,00	0,00	0,00	0,00	0,00
Malawi	0,00	0,00	0,00	0,00	0,00	0,00
Malaysia	0,04	0,00	0,10	0,00	0,02	0,00
Maldives	0,00	0,00	0,00	0,00	0,00	0,00
Mali	0,00	0,00	0,00	0,00	0,00	0,00
Malta	0,00	0,00	0,00	0,00	0,00	0,00
Martinique	0,00	0,00	0,00	0,00	0,00	0,00
Mauritania	0,00	0,00	0,00	0,00	0,00	0,00
Mauritius	0,00	0,00	0,00	0,00	0,00	0,00
Mexico	0,00	0,00	0,00	0,00	0,00	0,00
Moldova	0,00	0,00	0,00	0,00	0,00	0,00
Mongolia	0,00	0,00	0,00	0,00	0,00	0,00
Montenegro	0,00	0,00	0,00	0,00	0,00	0,00
Morocco	0,00	0,00	0,00	0,00	0,00	0,00
Mozambique	0,00	0,00	0,00	0,00	0,00	0,00
Myanmar	0,01	0,00	0,03	0,00	0,00	0,00
Nauru	0,00	0,00	0,00	0,00	0,00	0,00
Nepal	0,00	0,00	0,00	0,00	0,00	0,00
Netherlands	0,00	0,01	0,00	0,03	0,00	0,01
Netherlands Antilles	0,00	0,00	0,00	0,00	0,00	0,00
New Caledonia	0,00	0,00	0,00	0,00	0,00	0,00
New Zealand	0,04	0,07	0,00	0,01	0,01	0,02
Nicaragua	0,00	0,00	0,00	0,00	0,00	0,00
Niger	0,00	0,00	0,00	0,00	0,00	0,00
Nigeria	0,00	0,00	0,00	0,00	0,00	0,00
Niue	0,00	0,00	0,00	0,00	0,00	0,00
Norfolk Island	0,00	0,00	0,00	0,00	0,00	0,00
Norway	0,01	0,01	0,00	0,02	0,00	0,01
Oman	0,00	0,00	0,00	0,00	0,00	0,00
Pakistan	0,00	0,00	0,00	0,00	0,00	0,00
Palau	0,00	0,00	0,00	0,00	0,00	0,00
Panama	0,00	0,00	0,00	0,00	0,00	0,00
Papua New Guinea	0,02	0,00	0,04	0,00	0,00	0,00
Paraguay	0,00	0,00	0,00	0,00	0,00	0,00
Peru	0,00	0,00	0,00	0,00	0,00	0,00
Philippines	0,00	0,00	0,00	0,00	0,00	0,00
Pitcairn	0,00	0,00	0,00	0,00	0,00	0,00
Poland	0,00	0,00	0,00	0,01	0,00	0,00
Portugal	0,01	0,00	0,03	0,01	0,00	0,02

Qatar	0,00	0,00	0,00	0,00	0,00	0,00
Réunion	0,00	0,00	0,00	0,00	0,00	0,00
Romania	0,00	0,00	0,00	0,00	0,02	0,00
Russian Federation	0,39	0,43	0,30	0,02	0,12	0,04
Rwanda	0,00	0,00	0,00	0,00	0,00	0,00
Saint Helena	0,00	0,00	0,00	0,00	0,00	0,00
Saint Kitts and Nevis	0,00	0,00	0,00	0,00	0,00	0,00
Saint Pierre and Miq.	0,00	0,00	0,00	0,00	0,00	0,00
Saint Vincent and Gren.	0,00	0,00	0,00	0,00	0,00	0,00
Samoa	0,00	0,00	0,00	0,00	0,00	0,00
Sao Tome and Principe	0,00	0,00	0,00	0,00	0,00	0,00
Saudi Arabia	0,00	0,00	0,00	0,00	0,00	0,00
Senegal	0,00	0,00	0,00	0,00	0,00	0,00
Serbia	0,00	0,00	0,00	0,00	0,00	0,00
Seychelles	0,00	0,00	0,00	0,00	0,00	0,00
Sierra Leone	0,00	0,00	0,00	0,00	0,00	0,00
Singapore	0,00	0,00	0,00	0,00	0,00	0,00
Slovakia	0,01	0,01	0,01	0,01	0,01	0,00
Slovenia	0,00	0,00	0,00	0,00	0,00	0,00
Solomon Islands	0,01	0,00	0,02	0,00	0,00	0,00
Somalia	0,00	0,00	0,00	0,00	0,00	0,00
South Africa	0,00	0,00	0,00	0,01	0,00	0,02
Spain	0,00	0,00	0,00	0,02	0,00	0,02
Sri Lanka	0,00	0,00	0,00	0,00	0,00	0,00
Sudan	0,00	0,00	0,00	0,00	0,00	0,00
Suriname	0,00	0,00	0,00	0,00	0,00	0,00
Swaziland	0,00	0,00	0,00	0,00	0,00	0,00
Sweden	0,02	0,04	0,00	0,09	0,10	0,07
Switzerland	0,01	0,02	0,01	0,01	0,00	0,00
Syrian Arab Republic	0,00	0,00	0,00	0,00	0,00	0,00
Tajikistan	0,00	0,00	0,00	0,00	0,00	0,00
Tanzania, United Rep.	0,00	0,00	0,00	0,00	0,00	0,00
Thailand	0,00	0,00	0,00	0,01	0,01	0,00
Macedonia	0,00	0,00	0,00	0,00	0,00	0,00
Timor-Leste	0,00	0,00	0,00	0,00	0,00	0,00
Togo	0,00	0,00	0,00	0,00	0,00	0,00
Tonga	0,00	0,00	0,00	0,00	0,00	0,00
Trinidad and Tobago	0,00	0,00	0,00	0,00	0,00	0,00
Tunisia	0,00	0,00	0,00	0,00	0,00	0,00
Turkey	0,00	0,00	0,00	0,00	0,00	0,00
Turkmenistan	0,00	0,00	0,00	0,00	0,00	0,00
Turks and Caicos Isl.	0,00	0,00	0,00	0,00	0,00	0,00
Tuvalu	0,00	0,00	0,00	0,00	0,00	0,00
Uganda	0,00	0,00	0,00	0,00	0,00	0,00
Ukraine	0,02	0,01	0,02	0,00	0,01	0,00
United Arab Emirates	0,00	0,00	0,00	0,00	0,00	0,00
United Kingdom	0,00	0,01	0,00	0,01	0,00	0,00
U.S.A.	0,07	0,09	0,05	0,08	0,03	0,13
Uruguay	0,02	0,00	0,04	0,00	0,00	0,00
Uzbekistan	0,00	0,00	0,00	0,00	0,00	0,00
Wake Is	0,00	0,00	0,00	0,00	0,00	0,00
Vanuatu	0,00	0,00	0,00	0,00	0,00	0,00

Venezuela	0,00	0,00	0,00	0,00	0,00	0,00
Viet Nam	0,00	0,00	0,00	0,00	0,00	0,00
Yemen	0,00	0,00	0,00	0,00	0,00	0,00
Zambia	0,00	0,00	0,00	0,00	0,00	0,00
Zimbabwe	0,00	0,00	0,00	0,00	0,00	0,00

Appendix 4: Import market shares

Portion of world imports	Ind. RW	Ind. RW(Con)	Ind. RW (NC)	Paper and Paperboard	Wood Pulp	Sawnwood
Afghanistan	0,00	0,00	0,00	0,00	0,00	0,00
Albania	0,00	0,00	0,00	0,00	0,00	0,00
Algeria	0,00	0,00	0,00	0,00	0,00	0,01
American Samoa	0,00	0,00	0,00	0,00	0,00	0,00
Andorra	0,00	0,00	0,00	0,00	0,00	0,00
Angola	0,00	0,00	0,00	0,00	0,00	0,00
Antigua and Barbuda	0,00	0,00	0,00	0,00	0,00	0,00
Argentina	0,00	0,00	0,00	0,01	0,00	0,00
Armenia	0,00	0,00	0,00	0,00	0,00	0,00
Aruba	0,00	0,00	0,00	0,00	0,00	0,00
Australia	0,00	0,00	0,00	0,01	0,01	0,00
Austria	0,07	0,09	0,03	0,01	0,02	0,01
Azerbaijan	0,00	0,00	0,00	0,00	0,00	0,00
Bahamas	0,00	0,00	0,00	0,00	0,00	0,00
Bahrain	0,00	0,00	0,00	0,00	0,00	0,00
Bangladesh	0,00	0,00	0,01	0,00	0,00	0,00
Barbados	0,00	0,00	0,00	0,00	0,00	0,00
Belarus	0,00	0,00	0,00	0,00	0,00	0,00
Belgium	0,02	0,02	0,04	0,03	0,02	0,02
Belize	0,00	0,00	0,00	0,00	0,00	0,00
Benin	0,00	0,00	0,00	0,00	0,00	0,00
Bhutan	0,00	0,00	0,00	0,00	0,00	0,00
Bolivia	0,00	0,00	0,00	0,00	0,00	0,00
Bosnia and Herzegov.	0,00	0,00	0,00	0,00	0,00	0,00
Botswana	0,00	0,00	0,00	0,00	0,00	0,00
Brazil	0,00	0,00	0,00	0,01	0,01	0,00
British Indian Ocean Ter	0,00	0,00	0,00	0,00	0,00	0,00
British Virgin Islands	0,00	0,00	0,00	0,00	0,00	0,00
Brunei Darussalam	0,00	0,00	0,00	0,00	0,00	0,00
Bulgaria	0,00	0,00	0,00	0,00	0,00	0,00
Burkina Faso	0,00	0,00	0,00	0,00	0,00	0,00
Burundi	0,00	0,00	0,00	0,00	0,00	0,00
Cambodia	0,00	0,00	0,00	0,00	0,00	0,00
Cameroon	0,00	0,00	0,00	0,00	0,00	0,00
Canada	0,04	0,05	0,04	0,03	0,01	0,01
Cape Verde	0,00	0,00	0,00	0,00	0,00	0,00
Cayman Islands	0,00	0,00	0,00	0,00	0,00	0,00
Central African Republic	0,00	0,00	0,00	0,00	0,00	0,00
Chad	0,00	0,00	0,00	0,00	0,00	0,00
Chile	0,00	0,00	0,00	0,00	0,00	0,00
China	0,26	0,24	0,28	0,07	0,20	0,06

Christmas Island	0,00	0,00	0,00	0,00	0,00	0,00
Cocos (Keeling) Islands	0,00	0,00	0,00	0,00	0,00	0,00
Colombia	0,00	0,00	0,00	0,00	0,00	0,00
Comoros	0,00	0,00	0,00	0,00	0,00	0,00
Congo	0,00	0,00	0,00	0,00	0,00	0,00
Congo, Dem. Rep.	0,00	0,00	0,00	0,00	0,00	0,00
Cook Islands	0,00	0,00	0,00	0,00	0,00	0,00
Costa Rica	0,00	0,00	0,00	0,00	0,00	0,00
Côte d'Ivoire	0,00	0,00	0,00	0,00	0,00	0,00
Croatia	0,00	0,00	0,00	0,00	0,00	0,00
Cuba	0,00	0,00	0,00	0,00	0,00	0,00
Cyprus	0,00	0,00	0,00	0,00	0,00	0,00
Czech Republic	0,01	0,01	0,00	0,01	0,00	0,00
Denmark	0,01	0,00	0,01	0,01	0,00	0,02
Djibouti	0,00	0,00	0,00	0,00	0,00	0,00
Dominica	0,00	0,00	0,00	0,00	0,00	0,00
Dominican Republic	0,00	0,00	0,00	0,00	0,00	0,00
Ecuador	0,00	0,00	0,00	0,00	0,00	0,00
Egypt	0,00	0,00	0,00	0,01	0,00	0,01
El Salvador	0,00	0,00	0,00	0,00	0,00	0,00
Equatorial Guinea	0,00	0,00	0,00	0,00	0,00	0,00
Eritrea	0,00	0,00	0,00	0,00	0,00	0,00
Estonia	0,01	0,02	0,01	0,00	0,00	0,01
Ethiopia	0,00	0,00	0,00	0,00	0,00	0,00
Falkland Islands	0,00	0,00	0,00	0,00	0,00	0,00
Faroe Islands	0,00	0,00	0,00	0,00	0,00	0,00
Fiji	0,00	0,00	0,00	0,00	0,00	0,00
Finland	0,11	0,09	0,15	0,00	0,01	0,00
France	0,02	0,02	0,02	0,05	0,05	0,03
French Guiana	0,00	0,00	0,00	0,00	0,00	0,00
French Polynesia	0,00	0,00	0,00	0,00	0,00	0,00
French Southern Terr	0,00	0,00	0,00	0,00	0,00	0,00
Gabon	0,00	0,00	0,00	0,00	0,00	0,00
Gambia	0,00	0,00	0,00	0,00	0,00	0,00
Georgia	0,00	0,00	0,00	0,00	0,00	0,00
Germany	0,03	0,04	0,01	0,08	0,12	0,04
Ghana	0,00	0,00	0,00	0,00	0,00	0,00
Gibraltar	0,00	0,00	0,00	0,00	0,00	0,00
Greece	0,00	0,00	0,00	0,01	0,00	0,01
Greenland	0,00	0,00	0,00	0,00	0,00	0,00
Grenada	0,00	0,00	0,00	0,00	0,00	0,00
Guadeloupe	0,00	0,00	0,00	0,00	0,00	0,00
Guatemala	0,00	0,00	0,00	0,00	0,00	0,00
Guinea	0,00	0,00	0,00	0,00	0,00	0,00
Guinea-Bissau	0,00	0,00	0,00	0,00	0,00	0,00
Guyana	0,00	0,00	0,00	0,00	0,00	0,00
Haiti	0,00	0,00	0,00	0,00	0,00	0,00
Honduras	0,00	0,00	0,00	0,00	0,00	0,00
Hungary	0,00	0,00	0,00	0,01	0,00	0,01
Iceland	0,00	0,00	0,00	0,00	0,00	0,00
India	0,03	0,01	0,07	0,01	0,01	0,00
Indonesia	0,00	0,00	0,00	0,00	0,02	0,00

Iran, Islamic Rep.	0,00	0,00	0,00	0,00	0,00	0,01
Iraq	0,00	0,00	0,00	0,00	0,00	0,00
Ireland	0,00	0,00	0,00	0,00	0,00	0,01
Israel	0,00	0,00	0,00	0,00	0,00	0,00
Italy	0,03	0,03	0,04	0,04	0,08	0,06
Jamaica	0,00	0,00	0,00	0,00	0,00	0,00
Japan	0,08	0,11	0,03	0,02	0,05	0,07
Jordan	0,00	0,00	0,00	0,00	0,00	0,00
Kazakhstan	0,00	0,00	0,00	0,00	0,00	0,01
Kenya	0,00	0,00	0,00	0,00	0,00	0,00
Kiribati	0,00	0,00	0,00	0,00	0,00	0,00
Korea, D.P.R.	0,00	0,00	0,00	0,00	0,00	0,00
Korea, Rep.	0,05	0,07	0,01	0,01	0,05	0,01
Kuwait	0,00	0,00	0,00	0,00	0,00	0,00
Kyrgyzstan	0,00	0,00	0,00	0,00	0,00	0,00
Lao P.D.R.	0,00	0,00	0,00	0,00	0,00	0,00
Latvia	0,01	0,01	0,01	0,00	0,00	0,00
Lebanon	0,00	0,00	0,00	0,00	0,00	0,00
Lesotho	0,00	0,00	0,00	0,00	0,00	0,00
Liberia	0,00	0,00	0,00	0,00	0,00	0,00
Libyan Arab Jamahiriya	0,00	0,00	0,00	0,00	0,00	0,00
Liechtenstein	0,00	0,00	0,00	0,00	0,00	0,00
Lithuania	0,00	0,00	0,00	0,00	0,00	0,00
Luxembourg	0,00	0,00	0,00	0,00	0,00	0,00
Madagascar	0,00	0,00	0,00	0,00	0,00	0,00
Malawi	0,00	0,00	0,00	0,00	0,00	0,00
Malaysia	0,00	0,00	0,00	0,02	0,01	0,01
Maldives	0,00	0,00	0,00	0,00	0,00	0,00
Mali	0,00	0,00	0,00	0,00	0,00	0,00
Malta	0,00	0,00	0,00	0,00	0,00	0,00
Marshall Islands	0,00	0,00	0,00	0,00	0,00	0,00
Martinique	0,00	0,00	0,00	0,00	0,00	0,00
Mauritania	0,00	0,00	0,00	0,00	0,00	0,00
Mauritius	0,00	0,00	0,00	0,00	0,00	0,00
Mexico	0,00	0,00	0,00	0,03	0,03	0,03
Micronesia, Fed.	0,00	0,00	0,00	0,00	0,00	0,00
Moldova	0,00	0,00	0,00	0,00	0,00	0,00
Mongolia	0,00	0,00	0,00	0,00	0,00	0,00
Montenegro	0,00	0,00	0,00	0,00	0,00	0,00
Montserrat	0,00	0,00	0,00	0,00	0,00	0,00
Morocco	0,00	0,00	0,01	0,00	0,00	0,01
Mozambique	0,00	0,00	0,00	0,00	0,00	0,00
Myanmar	0,00	0,00	0,00	0,00	0,00	0,00
Nauru	0,00	0,00	0,00	0,00	0,00	0,00
Nepal	0,00	0,00	0,00	0,00	0,00	0,00
Netherlands	0,00	0,00	0,00	0,03	0,03	0,03
Netherlands Antilles	0,00	0,00	0,00	0,00	0,00	0,00
New Caledonia	0,00	0,00	0,00	0,00	0,00	0,00
New Zealand	0,00	0,00	0,00	0,00	0,00	0,00
Nicaragua	0,00	0,00	0,00	0,00	0,00	0,00
Niger	0,00	0,00	0,00	0,00	0,00	0,00
Nigeria	0,00	0,00	0,00	0,00	0,00	0,00

Niue	0,00	0,00	0,00	0,00	0,00	0,00
Norfolk Island	0,00	0,00	0,00	0,00	0,00	0,00
Northern Mariana Isl.	0,00	0,00	0,00	0,00	0,00	0,00
Norway	0,02	0,02	0,01	0,00	0,00	0,01
Oman	0,00	0,00	0,00	0,00	0,00	0,00
Pakistan	0,00	0,00	0,00	0,00	0,00	0,00
Palau	0,00	0,00	0,00	0,00	0,00	0,00
Panama	0,00	0,00	0,00	0,00	0,00	0,00
Papua New Guinea	0,00	0,00	0,00	0,00	0,00	0,00
Paraguay	0,00	0,00	0,00	0,00	0,00	0,00
Peru	0,00	0,00	0,00	0,00	0,00	0,00
Philippines	0,00	0,00	0,00	0,01	0,00	0,00
Pitcairn	0,00	0,00	0,00	0,00	0,00	0,00
Poland	0,01	0,01	0,02	0,02	0,01	0,00
Portugal	0,00	0,00	0,01	0,01	0,00	0,00
Qatar	0,00	0,00	0,00	0,00	0,00	0,00
Réunion	0,00	0,00	0,00	0,00	0,00	0,00
Romania	0,00	0,01	0,00	0,00	0,00	0,00
Russian Federation	0,00	0,01	0,00	0,01	0,00	0,00
Rwanda	0,00	0,00	0,00	0,00	0,00	0,00
Saint Helena	0,00	0,00	0,00	0,00	0,00	0,00
Saint Kitts and Nevis	0,00	0,00	0,00	0,00	0,00	0,00
Saint Lucia	0,00	0,00	0,00	0,00	0,00	0,00
Saint Pierre and Miquel.	0,00	0,00	0,00	0,00	0,00	0,00
Saint Vincent and Gren.	0,00	0,00	0,00	0,00	0,00	0,00
Samoa	0,00	0,00	0,00	0,00	0,00	0,00
Sao Tome and Principe	0,00	0,00	0,00	0,00	0,00	0,00
Saudi Arabia	0,00	0,00	0,00	0,01	0,00	0,01
Senegal	0,00	0,00	0,00	0,00	0,00	0,00
Serbia	0,00	0,00	0,00	0,00	0,00	0,00
Seychelles	0,00	0,00	0,00	0,00	0,00	0,00
Sierra Leone	0,00	0,00	0,00	0,00	0,00	0,00
Singapore	0,00	0,00	0,00	0,01	0,00	0,00
Slovakia	0,00	0,00	0,01	0,00	0,00	0,00
Slovenia	0,00	0,00	0,00	0,00	0,00	0,00
Solomon Islands	0,00	0,00	0,00	0,00	0,00	0,00
Somalia	0,00	0,00	0,00	0,00	0,00	0,00
South Africa	0,00	0,00	0,00	0,00	0,00	0,00
Spain	0,03	0,02	0,05	0,04	0,02	0,03
Sri Lanka	0,00	0,00	0,00	0,00	0,00	0,00
Sudan	0,00	0,00	0,00	0,00	0,00	0,00
Suriname	0,00	0,00	0,00	0,00	0,00	0,00
Swaziland	0,00	0,00	0,00	0,00	0,00	0,00
Sweden	0,05	0,04	0,07	0,01	0,01	0,00
Switzerland	0,00	0,00	0,00	0,01	0,01	0,00
Syrian Arab Rep.	0,00	0,00	0,00	0,00	0,00	0,00
Tajikistan	0,00	0,00	0,00	0,00	0,00	0,00
Tanzania	0,00	0,00	0,00	0,00	0,00	0,00
Thailand	0,00	0,00	0,01	0,01	0,01	0,01
Macedonia	0,00	0,00	0,00	0,00	0,00	0,00
Timor-Leste	0,00	0,00	0,00	0,00	0,00	0,00
Togo	0,00	0,00	0,00	0,00	0,00	0,00

Tokelau	0,00	0,00	0,00	0,00	0,00	0,00
Tonga	0,00	0,00	0,00	0,00	0,00	0,00
Trinidad and Tobago	0,00	0,00	0,00	0,00	0,00	0,00
Tunisia	0,00	0,00	0,00	0,00	0,00	0,00
Turkey	0,02	0,02	0,00	0,02	0,01	0,00
Turkmenistan	0,00	0,00	0,00	0,00	0,00	0,00
Turks and Caicos Isl.	0,00	0,00	0,00	0,00	0,00	0,00
Tuvalu	0,00	0,00	0,00	0,00	0,00	0,00
Uganda	0,00	0,00	0,00	0,00	0,00	0,00
Ukraine	0,00	0,00	0,00	0,01	0,00	0,00
United Arab Emirates	0,00	0,00	0,00	0,00	0,00	0,00
United Kingdom	0,00	0,00	0,00	0,07	0,03	0,06
U.S.A.	0,02	0,03	0,01	0,14	0,14	0,31
Uruguay	0,00	0,00	0,00	0,00	0,00	0,00
US Virgin Islands	0,00	0,00	0,00	0,00	0,00	0,00
Uzbekistan	0,00	0,00	0,00	0,00	0,00	0,00
Wake Is	0,00	0,00	0,00	0,00	0,00	0,00
Wallis and Futuna Isl.	0,00	0,00	0,00	0,00	0,00	0,00
Vanuatu	0,00	0,00	0,00	0,00	0,00	0,00
Venezuela	0,00	0,00	0,00	0,00	0,00	0,00
Western Sahara	0,00	0,00	0,00	0,00	0,00	0,00
Viet Nam	0,00	0,00	0,00	0,01	0,00	0,00
World +	1,00	1,00	1,00	1,00	1,00	1,00
Yemen	0,00	0,00	0,00	0,00	0,00	0,00
Zambia	0,00	0,00	0,00	0,00	0,00	0,00
Zimbabwe	0,00	0,00	0,00	0,00	0,00	0,00